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Marcus Ward's Arithmetic

J. W. MARSHALL, M.A.

MARCUS WARD'S

ARITHMETIC

J. W. MARSHALL, M.A.

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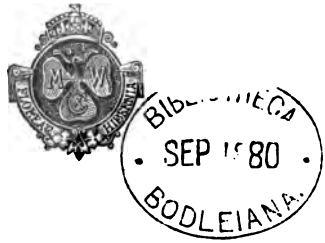

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ARITHMETIC.

PART I.

I.—INTRODUCTORY.

ANYTHING of which the question, "How much is there?" can be asked, is called a quantity (Lat. *quantum;* how much?).

Let us see in what form the answer to such a question is given. If it were asked, "How much butter have you in your basket?" the answer would be like this, "Six pounds." Or if it were asked, "How much time do you spend in school every day?" the answer would be perhaps, "Five hours." Thus to express how much there is of anything, we compare it with some convenient well-known quantity of the same kind, as a pound of butter, or an hour, in the above examples, and state how many times it contains that quantity. This quantity with which we compare others of the same kind in order to measure them is called a *unit*. Thus the complete expression of any quantity consists of two parts—(1) a mention of the unit in terms of which it is to be expressed; (2) the number of times it contains that unit.

This complete expression of a quantity is called a *concrete* number.

The properties of numbers do not depend on the unit employed: thus five and two make seven, whether they be shillings, sheep, or pounds of butter; hence we frequently reason about numbers without mentioning any particular unit; we then call them *abstract* numbers.

II.—NUMERATION AND NOTATION.

Numeration teaches us how to express numbers by words; *notation* by written symbols called figures.

The admirable systems of numeration and notation we possess are founded on the principle of counting by tens, which probably had its rise in a rude method of calculating by the fingers. By means of names for the first ten numbers we could express all others; thus we might count one, two, three, four, five, six, seven, eight, nine, ten, ten and one, ten and two, &c., up to ten and ten, or two tens; then we could go on, two tens and one, two tens and two, &c., up to ten tens, and so on. Instead of the awkward phrases used above, we use others which are generally only abbreviated forms of them; thus thirteen is three and ten, twenty is two tens, &c.; for ten tens we have a hundred, for ten tens of tens a thousand, &c. It will thus be found that thirty words enable us to express all numbers up to millions, beyond which we rarely require to go.

Our system of notation exactly corresponds to the above; the first nine numbers have distinct figures to represent them, viz., 1, 2, 3, 4, 5, 6, 7, 8, 9: any of these by itself, or to the right of other figures, represents the number of units its name implies; standing one place from the right of a number it represents so many tens of units, *i.e.* one of the numbers ten, twenty, thirty, &c.; standing two places from the right it represents so many tens of tens, or hundreds of units, and generally the number a figure represents is increased tenfold by placing it one

place farther to the left, according to the following table :—

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.

In order to indicate what is the place of a figure when the places after it are not all filled up with figures, we use the figure 0 (*nought*), which by itself simply means absence of number, to fill up vacancies. Thus by placing one 0 after a number, each figure of that number is increased tenfold in value, since it is moved one place further from the right; in the same way, placing two 0's after a number increases the value of each figure a hundredfold.

The above system of expressing numbers, besides being very convenient, owing to the small number of words and figures required, is especially valuable, as enabling us to form a more distinct conception of large numbers by showing how they are built up of smaller ones, whose significance we can more readily grasp.

To read any number consisting of a large number of figures, mark off the figures from the right by threes, and read the figures in the second group as thousands, those in the third as millions, those in the fourth as thousands of millions, &c., thus—

Thousands of Millions.	Millions.	Thousands.	Units.
3,	405,	876,	231

In words the above would be, three thousand four hundred and five millions, eight hundred and seventy-six thousand, two hundred and thirty-one.

Conversely, to write in figures any number given in words, write down the number of highest degree in the above table, put a comma, and in the next three places write the number of next lower degree, filling up, if necessary, with 0's, and so on.

1.—Read or write in words—

1. 16, 21, 10, 42, 13.
2. 89, 17, 71, 50, 35.
3. 426, 832, 700, 804.
4. 701, 380, 999, 171.
5. 3649, 6035, 1360.
6. 7000, 1608, 5100.
7. 18362, 10347, 83000.
8. 60006, 70012, 17300.
9. 837261, 600732, 602030.
10. 3511428, 1012012, 7000300.
11. 58345789, 91003000, 80635071.
12. 903086390, 173584210, 701001002.

2.—Express in figures—

1. Twelve, seventeen, twenty, thirty-one.

2. Fifty-six, ninety-one, seventy-four.

3. Three hundred and fifty-four, four hundred and eighty-one, eight hundred and seventy-five, seven hundred.

4. Six hundred and five, eight hundred, five hundred and forty, one hundred and ten.

5. One thousand eight hundred and seventy-six, three thousand five hundred and forty one, five thousand.

6. Seven thousand and thirty two, nine thousand three hundred and one, eight thousand and eighty.

7. Twelve thousand, thirty-three thousand nine hundred and eighty-one, eighty-four thousand and two.

8. Fifty thousand four hundred and eighty, seventeen thousand six hundred and forty-three, seventy thousand and seven.

9. Four hundred and eighty-six thousand five hundred and ninety-seven, four hundred and three thousand five hundred and fourteen, eight hundred thousand.

10. Nine hundred and thirty thousand five hundred and sixty, one hundred and eleven thousand and eleven, nine hundred and eighty thousand and eighty.

11. Four millions five hundred and forty-nine thousand three hundred and fifty-eight, six millions seven hundred and eight thousand four hundred and ninety, one million five hundred and eight thousand six hundred and five.

12. Ten millions, sixty-five millions eight hundred and ninety-seven thousand four hundred and eighty-one, thirty millions thirty-three thousand and thirty.

Additional exercises in notation can be obtained from any of the exercises in addition, &c.

Roman Notation.

Before the common or Arabic notation was introduced into this country, that used by the Romans was exclusively used; though very clumsy for purposes of calculation, it still keeps its place for numbering chapters of books, and for dates on inscriptions, title-pages, &c. In the following explanation of the Roman system only those forms in common use at the present time are given.

The figures, by combinations of which all numbers may be represented, are—

I.	standing for	one.
V.	,,	five.
X.	,,	ten.
L.	,,	fifty.
C.	,,	one hundred.
D.	,,	five hundred.
M.	,,	one thousand.

A smaller figure out of the above standing *before* a

larger diminishes the value of the latter by its own value, thus IX. means one from ten or nine.

Thus also—

IV. represents one less than five, or four.

XL. represents ten less than fifty, or forty.

XC. represents ten less than one hundred, or ninety, &c.

Any figure following an equal or greater one represents its own value, which is to be added to the value of the rest of the combination. The method of combining the figures will be made clearer by a few examples.

XVII. means ten, five, and two, or seventeen.

XXXIII. means three tens and three, or thirty-three.

CXLV. means one hundred, forty, and five.

MDCCLXII. means one thousand, five hundred, two hundred, fifty, ten, and two, or seventeen hundred and sixty-two.

Such combinations as XXXXXX., meaning six tens or sixty, are never used, the shorter form LX. being always preferred.

3.—Express in words or Arabic figures—

1. VIII., XIII., XX., XV., XXXI., LVI.
2. XIV., XXVII., XIX., XLI., XCII., LXXV.
3. XLVI., LXIV., CCII., CLXXXI., DCCVI., MDC.
4. CM., MDCCXI., MXLII., DCCXC., DCX.
5. CDXLIV., MMDCIX., MCMLXXVIII., MDCCCLXXVII.

4.—Express in Roman notation—

1. 8, 11, 15, 32, 101, 205.
2. 24, 36, 84, 41, 60, 510.
3. 46, 64, 355, 1009, 2200.
4. 443, 1936, 2041, 3317, 990.
5. 1523, 2819, 3749, 1066, 1814.

III.—ADDITION.

The number which is equal to two or more numbers taken together is called their *sum:* the process of finding this sum is called *addition.*

The sign + (read *plus*), placed between two numbers means that they are to be added together.

The sums of all pairs of numbers from 1 to 9 are given in the following table, with which the pupil should be quite familiar before proceeding further.

1 and	2 and	3 and	4 and	5 and
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6
2 „ 3	2 „ 4	2 „ 5	2 „ 6	2 „ 7
3 „ 4	3 „ 5	3 „ 6	3 „ 7	3 „ 8
4 „ 5	4 „ 6	4 „ 7	4 „ 8	4 „ 9
5 „ 6	5 „ 7	5 „ 8	5 „ 9	5 „ 10
6 „ 7	6 „ 8	6 „ 9	6 „ 10	6 „ 11
7 „ 8	7 „ 9	7 „ 10	7 „ 11	7 „ 12
8 „ 9	8 „ 10	8 „ 11	8 „ 12	8 „ 13
9 „ 10	9 „ 11	9 „ 12	9 „ 13	9 „ 14

6 and	7 and	8 and	9 and
1 are 7	1 are 8	1 are 9	1 are 10
2 „ 8	2 „ 9	2 „ 10	2 „ 11
3 „ 9	3 „ 10	3 „ 11	3 „ 12
4 „ 10	4 „ 11	4 „ 12	4 „ 13
5 „ 11	5 „ 12	5 „ 13	5 „ 14
6 „ 12	6 „ 13	6 „ 14	6 „ 15
7 „ 13	7 „ 14	7 „ 15	7 „ 16
8 „ 14	8 „ 15	8 „ 16	8 „ 17
9 „ 15	9 „ 16	9 „ 17	9 „ 18

The addition table will enable us to add a number of one figure to any other number, thus—To add 63 and 6. 63 is 60 and 3; now 3 and 6 make 9 by the table, therefore we have 60 and 9, or 69.

To add 85 and 9. As before, 5 and 9 are 14 by the table, therefore we have 80 and 14, or 8 tens, 1 ten, and 4, or 9 tens and 4, or 94.

The pupil should be exercised with a large number of questions like the above until able to give the correct answer at once, before proceeding to the written exercises. To add numbers of more than one figure we use the principle that we may split them up into units, tens, &c., and add up the units, tens, &c., of the numbers to be added to find how many units, tens, &c., there are in the result. A simple example will make this clearer. Suppose we have to add 5847 and 1439, we may reason thus—

5849 is 5 thousands, 8 hundreds, 4 tens, 9 units.
1437 is 1 thousand, 4 hundreds, 3 tens, 7 units.

Therefore altogether we have

6 thousands, 12 hundreds, 7 tens, 16 units.

Now 12 hundreds is 1 thousand, 2 hundreds, and 16 units is 1 ten and 6 units. Therefore we may write our result—

7 thousands, 2 hundreds, 8 tens, 6 units, or 7286.

In practice the process is carried on as in the following example.

Add 9374, 103, 792, 6810.

Place the numbers in a column, units under units, tens under tens, &c., and draw a line under them as in the margin. Adding the units column we get 9, which is put down in the units place of the answer. The numbers in the tens column added give us 17, of which the 7 (meaning 7 tens) is placed in the answer, and the 1 (meaning ten tens or 1 hundred) is added in with the next column, which thus gives 25; the five is put down, and, as before, the 2 is carried on to the next column, which thus gives 17, and the complete answer is 17579.

9874	
103	
792	
6810	
17579	

5.

1.	*2.*	*3.*	*4.*	*5.*
12	51	33	34	31
21	22	12	20	50
13	14	31	41	13
32	12	22	13	32

6.	*7.*	*8.*	*9.*	*10.*
34	16	19	27	38
45	45	34	31	81
50	23	57	56	17
12	52	80	24	43

6.

1.	*2.*	*3.*	*4.*	*5.*
63	84	87	58	75
17	6	20	9	83
5	17	34	17	90
24	32	5	4	8
48	95	56	85	14

6.	*7.*	*8.*	*9.*	*10.*
74	50	99	58	35
36	38	54	36	8
51	9	36	4	59
82	17	7	85	3
5	82	40	90	40
26	44	8	17	9

7.—Add together—

1. 34, 21, 15, 7, 3.
2. 10, 21, 32, 43, 8.
3. 7, 17, 35, 61, 48.
4. 35, 9, 46, 8, 37.
5. 30, 4, 47, 28, 62.
6. 55, 13, 86, 75, 37.
7. 90, 18, 9, 67, 85.
8. 56, 78, 36, 80, 49.
9. 65, 82, 7, 24, 30, 78.
10. 21, 56, 13, 7, 42, 8.
11. 10, 64, 19, 63, 6, 17.
12. 15, 73, 31, 9, 53, 65.
13. 93, 8, 6, 57, 78, 39.
14. 64, 75, 3, 5, 91, 40.
15. 13, 22, 92, 47, 8, 23.
16. 57, 39, 4, 83, 76, 17.

8.—Find the value of—

1. 7 + 13 + 19 + 25 + 31.
2. 24 + 30 + 37 + 45 + 54.
3. 31 + 82 + 58 + 70 + 9.
4. 27 + 6 + 75 + 63 + 32.
5. 8 + 40 + 83 + 61 + 19.
6. 80 + 56 + 7 + 34 + 78.
7. 15 + 36 + 5 + 9 + 72.
8. 3 + 57 + 72 + 3 + 63.
9. 48 + 32 + 6 + 18 + 31.
10. 51 + 8 + 90 + 78 + 49.

11. 64 + 59 + 35 + 29 + 32 + 54 + 94.
12. 37 + 8 + 60 + 82 + 17 + 35 + 52.
13. 19 + 36 + 8 + 6 + 52 + 48 + 9.
14. 20 + 47 + 29 + 61 + 3 + 10 + 42.
15. 5 + 48 + 8 + 71 + 43 + 82 + 77.

9.—Add together—

1. Seventeen; six; twenty-four; nine.

2. Thirty-one; forty-three; ten; eight.

3. Fifty-four; sixty-seven; three; fifty-nine.

4. Forty-one; thirty; sixty-six; four.

5. Fifty-three; sixty-five; seven; twenty-one.

6. Eighty-eight; sixteen; five; fifty; thirty-one.

7. Seventy-one; sixty-two; eight; ninety-four; eighteen.

8. Thirty-eight; seventy-four; fifty-six; twenty; fifty.

9. Fifty-one; nine; thirty-six; forty-eight; sixty.

10. Thirty-seven; seventeen; six; fifty-four; seventy-three.

11. Twenty-four; thirty-two; forty; forty-eight; fifty-six.

12. Thirty-five; forty-two; forty-nine; fifty-six; seven.

13. Seventy-six; eighty-five; forty-nine; ten; three.

14. Twenty-three; eleven; ninety-four; eighty-two; nine.

15. Fifty-six; thirty; sixty-five; nineteen; twenty-three.

10. Add together—

1. Sixty-two; seventy-one; seven; seventy.

2. Eighty-four; forty-eight; fourteen; eighteen.

3. Nine; nineteen; ninety; thirty-three; ten.

4. Twenty-three; eighty; eleven; seventeen; six.

5. Fifty-four; three; ninety-nine; forty; eighty-four.

6. Ten; twenty-three; one; forty-five; eight.

7. Seventy-six; seventy; six; fourteen; nine.

8. Forty-four; eleven; ninety-one; eighty-five; two.

9. Twelve; twenty; fifty-three; eighty-one; eight.

10. Seventy-seven; seventeen; seven; seventy; ten.

11. Twenty-five; forty-seven; eighty-two; four; three.

12. Sixty-three; fifty-two; one; thirty-four; eighty.

13. Nineteen; four; forty-one; fourteen; twelve.

14. Nine; three; forty-three; sixty-two; five.

15. Fifty-six; forty-eight; five; thirty; thirteen.

16. Eleven; ninety; fifty-eight; seventy-one; eight.

17. Fifty-four; twenty-seven; seventy-two; ten; fourteen.

11.

1.	*2.*	*3.*	*4.*	*5.*
331	130	452	456	731
410	254	341	341	260
536	613	530	652	507
142	232	224	705	434
6.	*7.*	*8.*	*9.*	*10.*
459	341	728	169	416
325	547	862	309	987
831	129	950	877	161
718	103	811	914	727
156	341	407	738	625

12.

1.	*2.*	*3.*	*4.*	*5.*
476	561	462	764	876
47	438	60	801	21
698	750	573	542	543
32	34	82	68	63
121	12	4	53	742

12. *(Continued.)*

6.	*7.*	*8.*	*9.*	*10.*
890	600	702	421	836
367	60	318	937	13
67	806	38	74	654
9	53	461	325	9
589	437	9	68	706
701	659	75	520	258

13.—Find the value of—

1. 314 + 596 + 172 + 233 + 480.
2. 532 + 443 + 354 + 265 + 176.
3. 684 + 317 + 765 + 856 + 504.
4. 300 + 567 + 765 + 293 + 811.
5. 740 + 932 + 167 + 634 + 533.
6. 432 + 56 + 864 + 4 + 112 + 224.
7. 459 + 418 + 8 + 649 + 66 + 335.
8. 346 + 377 + 53 + 256 + 87 + 11.
9. 694 + 554 + 473 + 31 + 54 + 6.
10. 15 + 246 + 935 + 438 + 72 + 8.
11. 598 + 255 + 435 + 6 + 465 + 98.
12. 860 + 762 + 34 + 287 + 97 + 607.
13. 374 + 679 + 63 + 23 + 7 + 643.
14. 681 + 7 + 923 + 86 + 112 + 979.
15. 8 + 750 + 97 + 194 + 6 + 538.

14.—Add together—

1. 312, 534, 117, 340, 643, 91.
2. 301, 515, 261, 752, 460, 537.
3. 647, 758, 536, 425, 314, 600.
4. 958, 736, 173, 625, 847, 72.
5. 616, 500, 804, 793, 648, 61.
6. 35, 637, 334, 857, 570, 17, 837.
7. 932, 76, 461, 50, 352, 3, 912.
8. 473, 382, 49, 625, 9, 106, 50.
9. 645, 93, 509, 325, 494, 37, 86.
10. 847, 864, 332, 213, 53, 6, 11.

11. 157, 330, 915, 36, 593, 85, 917, 30.
12. 453, 72, 6, 481, 25, 654, 25, 990.
13. 946, 70, 435, 953, 89, 130, 13, 567.
14. 594, 837, 26, 486, 972, 84, 96, 432.
15. 463, 709, 583, 79, 548, 710, 542, 861.

15.—Add together—

1. Five hundred and sixty-three; four hundred and thirty-two; seven hundred and eighteen; one hundred and thirty-one; six hundred.

2. Five hundred and thirty-one; six hundred and forty-two; seven hundred and eighty-one; one hundred and thirty-six; three hundred and eight.

3. Seven hundred and twelve; three hundred and forty-five; five hundred and seven; three hundred and twenty-nine; four hundred and ninety-three.

4. One hundred and eighty-six; two hundred and forty-two; three hundred and twelve; seven hundred and eighty-six; sixty.

5. Four hundred and thirty-five; ten; seven hundred and forty-three; five hundred and eighteen; ninety-four.

6. Three hundred and ninety-nine; one hundred and eleven; five hundred and twenty-one; seven hundred and thirty; seventy-two.

7. Four hundred and fifty-three; six hundred and two; one hundred and eighty-one; seventeen; sixty-four.

8. Five hundred and twenty-eight; four hundred and seventy; three hundred and sixteen; nine hundred and twenty-seven; eight hundred and one.

9. Three hundred and seventy-two; four hundred and ninety-five; thirty-six; ninety-seven; three hundred and eighteen.

10. Four hundred and seventeen; nine hundred and thirty-four; eight hundred and twenty-five; sixty-one; nine.

11. Eighty-three; six hundred and seventeen; four hundred and thirty; nine hundred and fifty-four; seventeen; eight hundred and ninety-one.

12. Five hundred and forty-three; seven hundred and sixty-one; one hundred and forty-seven; two hundred and sixty-two; five hundred and thirty-one; two hundred and ten.

13. Four hundred and sixty-three; one hundred and eighty-seven; six hundred and ten; six hundred and sixty-eight; seventy-one; seven hundred and thirty-four.

14. One hundred; five hundred and thirty-nine; thirty-six; eight; two hundred and thirty-one; five hundred and six.

15. Six hundred and thirty-five; four hundred and twenty-three; five hundred; twelve; four hundred and sixty-one; seventy-nine.

16.—Add together—

1. Two hundred and two; twenty; eight hundred and ninety-six; five.

2. Sixty-three; five hundred; three hundred and seventy; seventeen.

3. Six hundred; sixteen; sixty-six; twelve.

4. Four hundred and five; eighty-one; five hundred and four; five hundred and forty.

5. Twenty-nine; two hundred and nine; three hundred and eighty-one; nine.

6. Six hundred and fifty; two hundred and five; forty-eight; three hundred.

7. Seven; nine hundred and ninety-nine; fifty-six; three hundred and thirteen; thirty-three.

8. Five hundred and eighty-four; eight hundred and forty-five; fourteen; sixty-one.

9. Nine hundred and nineteen; nine hundred and ninety; nine hundred and nine; ninety-nine.

10. Eight hundred and fifty-four; ten; six hundred and seventy; fifteen; eight hundred.

11. Three hundred and forty; one hundred and one; one hundred and eleven; eighty-seven.

12. Seventy; seven; two hundred and eighty-three; four hundred and ninety-eight; forty-eight.

13. Five hundred and three; five hundred and thirteen; fifty-three; seven hundred and eleven.

14. Eight hundred and eight; eighty-eight; nine hundred and seven; seven hundred and ninety.

15. Sixty-three; four hundred; fifty; seven; eight hundred and thirty-one; five hundred and thirteen.

16. Seventy-one; five hundred and five; eighteen; sixty-four; nine hundred and five.

17.

1.	*2.*	*3.*	*4.*	*5.*
4325	6324	7014	3184	5318
6014	1741	3561	5036	9201
8650	2285	4875	7912	1875
2257	3439	1340	4257	2361

6.	*7.*	*8.*	*9.*	*10.*
6324	5631	3151	8100	3796
5282	6243	4297	3567	6530
1973	1587	8106	4810	1984
2148	9015	3001	1245	4340
4364	6624	2454	2468	2352

18.

1.	*2.*	*3.*	*4.*	*5.*
7134	8100	5603	4396	431
1058	965	1465	253	9768
3976	341	891	861	5430
8134	1352	317	7134	673
7716	3614	454	5007	318

6.	7.	8.	9.	10.
9307	5566	3174	1825	1312
456	1380	953	7604	879
1280	57	64	189	5130
531	4732	7709	3516	6046
6864	764	348	9042	319
372	9148	52	85	51

19.—Add together—

1. 3518, 4520, 7306, 1871, 9465.
2. 6310, 7814, 5392, 4726, 5361.
3. 351, 7458, 537, 9026, 5536.
4. 1568, 3071, 3467, 5028, 6745.
5. 8379, 1064, 5314, 8324, 7163, 8342.
6. 6350, 751, 8941, 1307, 63, 3267.
7. 45, 1824, 117, 3506, 134, 999.
8. 5743, 6, 3206, 4659, 74, 341.
9. 2318, 18, 535, 7324, 3698, 1662.
10. 1051, 3125, 186, 3734, 1861, 815.
11. 128, 1185, 6093, 56, 1453, 1357, 42.
12. 3812, 52, 766, 1491, 3096, 1555, 6.
13. 1380, 524, 4461, 9, 138, 6934, 34.
14. 8103, 94, 624, 4840, 1760, 1066, 87.
15. 1418, 6748, 144, 3107, 81, 6714, 5603.

20.—Find the value of—

1. 7910 + 5138 + 6193 + 8010 + 1066.
2. 1240 + 8682 + 1971 + 8109 + 7836.
3. 1601 + 9630 + 8014 + 1657 + 7164.
4. 5461 + 8194 + 9181 + 3148 + 9415.
5. 5311 + 9153 + 2211 + 5738 + 8102.
6. 3871 + 1824 + 320 + 2771 + 192 + 273.
7. 277 + 19 + 936 + 8126 + 3987 + 2232.
8. 2154 + 904 + 1927 + 8420 + 371 + 1252.
9. 9331 + 73 + 467 + 4752 + 7145 + 658.
10. 7857 + 8795 + 79 + 13 + 5832 + 6442.
11. 1264 + 531 + 4154 + 6 + 3276 + 7623.
12. 1355 + 4223 + 164 + 63 + 2409 + 33.

21.—Add together—

1. Six thousand four hundred and twenty-two; two thousand nine hundred and twenty-nine; eight thousand one hundred and forty-two; one thousand three hundred and sixty-three.

2. Five thousand three hundred and seventy-four; six thousand and fifty; two thousand one hundred and seventeen; seven thousand five hundred and thirty-one.

3. Eight thousand; five thousand six hundred and ten; six thousand two hundred and seven; one thousand eight hundred and fourteen; three thousand three hundred and eighty-four.

4. Five thousand and eighteen; three hundred and forty-four; one thousand four hundred and eleven; seven hundred and twenty-four; seventy-one.

5. Five thousand one hundred and forty-three; four thousand and eight; fifty-seven; nine; seven hundred and thirty-four; four thousand nine hundred and ninety-seven.

6. Eighty-five; six thousand eight hundred and fifty-four; one thousand and eleven; four hundred and seventy-one; nine thousand three hundred and fifty-five.

7. Three thousand five hundred and four; eight hundred and twenty-three; forty-nine; one thousand eight hundred and eighty-three.

8. Five thousand three hundred and sixty; ten; one hundred and seventy-seven; three thousand seven hundred; seven thousand six hundred and fifty-four; thirty-six.

9. Nine thousand three hundred and twenty-eight; one thousand and sixty-four; seven hundred and fifty-nine; three hundred and seventy-one; six thousand four hundred and fifty-three.

10. Three hundred and twelve; four thousand five hundred and sixty-eight; seventy-one; five hundred and seventeen; nine thousand seven hundred and thirty; three thousand.

11. Four thousand and four; four hundred and forty; thirty-seven; seven thousand three hundred and eleven; two thousand six hundred and seventy-five; eight.

12. Fifty-four; six thousand three hundred and twenty-one; three hundred and forty-three; eight thousand one hundred and sixty-three; four hundred and thirty-five.

13. Twelve hundred and eighty-seven; seventeen hundred and three; eight hundred and ninety-four; fifty; fifteen hundred.

14. Eighty-seven; sixteen hundred and thirty-one; five hundred and eleven; three thousand eight hundred and forty-four; one hundred and seven; eight thousand five hundred and forty-three.

15. Seven thousand four hundred and seven; nineteen hundred and seventy-six; four hundred and thirty-one; two thousand three hundred and ninety-eight; seventeen; six thousand.

22.—Add together—

1. Three thousand and ten; four hundred and five; eight hundred and forty-three; seven thousand.

2. Eight thousand two hundred; seven hundred and seventeen; seven thousand and seventy; twenty-five.

3. Four thousand two hundred and thirty-four; nineteen; six hundred and twelve; two thousand three hundred.

4. Five thousand and fifteen; five hundred and fifty; seven thousand and eight; four thousand and thirty.

5. Seven thousand and twenty-five; three hundred and fifty-two; eighty-four; five thousand and four.

6. Seven hundred and fourteen; one thousand four hundred and fifty-one; thirty-seven; seven hundred and six.

7. Three thousand and thirty-three; three thousand three hundred and thirty; four hundred; sixty-eight.

8. Five thousand and forty; six thousand seven hundred; eight thousand and sixty-seven; five hundred and five; nine.

9. Eight; two hundred and thirty-one; three thousand nine hundred; seven hundred and seventy.

10. Four thousand five hundred and eighty-four; nineteen; one thousand and twenty; fifty-six; nine hundred and ninety.

11. Seventeen hundred and seventy-three; eighteen hundred and eighteen; four thousand five hundred; twenty-five.

12. Seven hundred and fifty-four; eleven hundred and eighty; one thousand and ten; five hundred and thirty-nine.

13. Six; sixteen hundred and sixty; ninety-eight; six thousand and sixteen; five hundred and eighty-three; nine thousand.

14. Fifty; fourteen hundred and twenty-one; four thousand one hundred and twelve; six hundred; thirty-seven.

15. Eighteen hundred and seventy-six; three thousand and five; nine hundred and thirty; twenty; fifteen hundred.

16. Five thousand and eleven; fifty-nine; sixteen hundred and forty; seven hundred and ninety-eight; twenty-four.

23.

1.	*2.*	*3.*	*4.*
73562	83456	17369	731205
80371	7201	892	34816
53800	36519	6007	52903
16329	423	43218	315417
65076	57812	67891	4379
91325	6954	3504	861

23. *(Continued.)*

5.	*6.*	*7.*	*8.*
763814	62071	43159	713024
20079	89	2076	8172
3258	5324	82631	4290
416305	763	132	605123
83740	84105	9400	71086
5342	91027	63981	83214
9.	*10.*	*11.*	*12.*
42379	62453	402367	731206
5308	7160	71205	89731
76152	90812	638	250
9630	637	573147	30187
889	54	64052	5643
57314	72638	8154	271508

24.—Add together—

1. 73056, 8912, 63, 740, 949361, 15607, 342.

2. 9761, 600721, 736001, 892, 134681, 56321, 89.

3. 87034, 526, 78321, 26, 93074, 1825, 78349, 83427, 81.

4. 7235, 81479, 198, 70039, 58000, 6371, 493, 5812.

5. 72, 18376, 9037, 628341, 7234, 158, 37, 5036.

6. 281056, 190072, 4352, 879, 6376, 420150, 103, 5931, 143962.

7. 6345137, 72400, 837, 641072, 5937219, 837002, 5431, 82003.

8. 13579, 2040608, 527983, 6271, 53426, 870315, 718, 60983, 5360.

9. 72641, 83079, 4351, 183061, 796849, 53064, 137526, 8345, 9831, 82460.

10. 623057, 712425, 898, 763, 58124, 609851, 71134, 88942, 63248.

11. 75361, 83247, 400300, 59910, 637, 7360, 824517, 736498, 431127.

12. 17650, 183240, 778832, 8324, 75096, 821937, 493, 6645, 93, 538017.

25.—Add together—

1. Seventeen thousand and six; eight hundred and thirty-seven; five million eighty-four thousand seven hundred and eleven; ninety-eight.

2. Six hundred and twelve thousand two hundred; three thousand and eighty; one hundred and fifty-three; eighty-nine thousand and twenty-one.

3. Eight thousand and thirty-nine; one million nine hundred and ninety-five thousand six hundred and four; four thousand and forty.

4. Sixty thousand and sixty; seventy-eight; five hundred and two thousand and two; three hundred and nineteen.

5. Three thousand and seventy; thirteen million five hundred thousand; eight hundred thousand and ninety-two; forty-five.

6. Sixty-one thousand and thirty-eight; eleven thousand three hundred; four hundred and seventy-seven; three hundred and ten thousand and eighty.

7. Forty-seven; nine million five hundred and twenty-six thousand and forty-one; sixty-seven thousand; three hundred and fifty millions.

8. One million nine thousand and forty; seventy-three thousand five hundred and five; eight hundred and ninety-six; ninety thousand four hundred.

9. Four hundred and twenty thousand three hundred and one; nineteen thousand four hundred and eighty-nine; eleven hundred and fifty-six; sixty-three thousand and nineteen.

10. Four thousand three hundred and ten; five millions thirty thousand nine hundred; ninety thousand and twenty-nine; eighteen hundred and forty-five.

26.—Show that the numbers in the following square make 8085, whether added by rows or columns, or from corner to corner—

1129	2070	2580	1398	908
1551	914	1975	3283	362
147	1456	1617	939	3926
3831	850	420	2260	724
1427	2795	1493	205	2165

27.

1. A farmer has sixty-three chickens and eighty-one eggs. How many chickens will he have if all the eggs are hatched?

2. A boy has twenty-four marbles on Monday; if he wins eleven on Tuesday, fourteen on Wednesday, five on Thursday, twenty-three on Friday, how many will he then have?

3. In a wood there are two hundred and ninety-four oak trees, three hundred and seventy-five elm, sixty-five beech, and sixty-three ash. How many trees are there altogether?

4. A woman going to market with a basket of eggs fell on the way and broke twenty-seven; she sold eighty-four, and carried home nineteen: how many had she to start with?

5. In a confectioner's window there are four bottles, the first containing three hundred and forty-two red lolipops, the second four hundred and sixty-nine yellow ones, the third two thousand and eighty small white ones, and the fourth fifty-one large brown ones; how many are there altogether?

6. A man is twenty-five years older than his son, who is thirteen; what is his age?

7. A town contains six thousand eight hundred and eighty men, seven thousand and eleven women, and eight thousand one hundred children; what is its whole population?

8. In a railway train there are one hundred and four third-class passengers, sixty-three second-class, and twenty-eight first-class; how many people does the train carry, including the guard, engine driver, and stoker?

9. In a factory there are two hundred and seventeen men, sixty-eight women, and forty-one boys; how many hands are there in all?

10. A greengrocer sold one hundred and twelve apples on Monday, three hundred and forty on Tuesday, ninety-eight on Wednesday, two hundred and nine on Thursday, on Friday as many as on Monday and Tuesday, and on Saturday as many as on Wednesday and Thursday; how many did he sell in the week?

11. How many people can be seated in five churches, of which the first holds seven hundred and forty-one, the second eighty-two more than the first, the third four hundred and seventeen, the fourth and fifth five hundred and eighty-eight each?

12. The first of three fishing boats catches fourteen thousand five hundred and thirty-two herrings, the second catches three thousand two hundred more than the first, the third eight hundred and thirty-nine more than the second; how many did they catch altogether?

13. There are three schools, in the first of which there are ninety-one boys and eighty-two girls, in the second four more boys and ten more girls than in the first, and in the third fifty-three boys and sixty-one girls. (1) How many boys? (2) How many girls? (3) How many are there altogether in the three schools?

IV.—SUBTRACTION.

The process of finding what number is left when the smaller of two numbers is taken from the greater is called *subtraction:* or, as we may state it, subtraction is the method of finding what number added to the smaller of two numbers will make the greater. Thus subtraction is exactly the *converse* of addition.

The sign −, read *minus*, placed between two numbers indicates that the latter (which must of course be the smaller) is to be subtracted from the former.

The addition table will serve also for subtraction; thus to subtract 7 from 15 the pupil should ask himself the question—"What number added to 7 makes 15?" If the table is thoroughly known he will at once be able to answer "8."

In the subtraction of large numbers we proceed piecemeal as in addition, subtracting units from units, tens from tens, &c. Here, however, a difficulty may arise, as in the following example. Subtract 372 from 536.

536 is 5 hundreds, 3 tens, 6 units.
372 is 3 hundreds, 7 tens, 2 units.

We can take the two units from the 6 units, and the 3 hundreds from the five hundreds; but 7 tens cannot be subtracted from 3 tens. To get over the difficulty, we observe that the difference of two numbers will not be altered by adding the same number to both; let us then add one hundred to the lower number, and ten tens, which is the same thing, to the upper. Our numbers will now be

5 hundreds, 13 tens, 6 units.
4 hundreds, 7 tens, 2 units.

And now each number in the lower line can be taken from the corresponding one above, and we get

1 hundred, 6 tens, 4 units, or 164.

Hence the rule.

Rule.—Place the number to be subtracted under the other, units under units, tens under tens, &c.; subtract, if possible, each figure in the lower line from the one above it, and write down the result beneath it. If any figure in the lower line is greater than that above it, imagine the *upper* figure increased by ten, which will always make the subtraction possible; and in performing the next subtraction, imagine the *lower* figure increased by one.

28.

1. 549 132	*2.* 634 223	*3.* 989 564	*4.* 792 371	5. 628 214
6. 7358 2131	*7.* 6473 4130	*8.* 9756 4321	*9.* 8546 8234	*10.* 6159 2017
11. 6394 5104	*12.* 4527 4226	*13.* 8376 2304	*14.* 5178 4007	*15.* 6289 6187
16. 7504 3201	*17.* 9764 3454	*18.* 6482 3381	*19.* 7059 6048	*20.* 8900 3400

29.

1. 9347 8162	*2.* 6479 3541	*3.* 8755 3284	*4.* 3492 1724	*5.* 5763 3401
6. 5816 3241	*7.* 7946 7466	*8.* 6155 4506	*9.* 2467 2285	*10.* 5430 5280
11. 8364 7655	*12.* 3915 1419	*13.* 5182 1729	*14.* 8391 7472	*15.* 6374 4915
16. 5637 4819	*17.* 8371 7564	*18.* 6437 5749	*19.* 8561 4870	*20.* 7458 6574

30.

1. 85063 34751	*2.* 30485 13296	*3.* 71040 49151	*4.* 68078 14585
5. 20743 15365	*6.* 36425 27536	*7.* 46800 15371	*8.* 80032 76684
9. 86415 77482	*10.* 56101 13259	*11.* 48700 45431	*12.* 70806 65074
13. 73405 65819	*14.* 20360 17506	*15.* 13542 12648	*16.* 80070 51138
17. 35600 25601	*18.* 60000 47823	*19.* 40137 30158	*20.* 71250 60844

31.—Find the value of—

1.	806 – 757.	*11.*	508329 – 317504.
2.	674 – 668.	*12.*	930155 – 371045.
3.	7450 – 2356.	*13.*	156431 – 137082.
4.	5034 – 4082.	*14.*	572493 – 325604.
5.	7321 – 4148.	*15.*	766002 – 656012.
6.	8347 – 6578.	*16.*	812591 – 238406.
7.	1876 – 1066.	*17.*	273995 – 160798.
8.	7630 – 7543.	*18.*	810507 – 721615.
9.	4328 – 3479.	*19.*	930258 – 873009.
10.	8100 – 1637.	*20.*	710236 – 426578.

32.

1. 7364 175	*2.* 8930 763	*3.* 1645 560	*4.* 45904 3076

5. 71610	*6.* 8172	*7.* 2756	*8.* 5032
318	304	819	141
9. 72051	*10.* 90370	*11.* 79364	*12.* 83400
3262	6438	577	501
13. 60573	*14.* 27081	*15.* 38005	*16.* 500126
824	7092	8026	715
17. 74135	*18.* 80000	*19.* 16407	*20.* 605007
478	742	6508	7208

33.—Find the value of—

1.	60542 – 1368.	*11.*	280356 – 71407.
2.	70000 – 6051.	*12.*	890123 – 45608.
3.	89113 – 8074.	*13.*	100732 – 846.
4.	29368 – 749.	*14.*	817634 – 16805.
5.	173581 – 81680.	*15.*	192361 – 92562.
6.	750325 – 6417.	*16.*	825736 – 82573.
7.	164001 – 8324.	*17.*	600000 – 4182.
8.	185127 – 86048.	*18.*	731062 – 21740.
9.	37409 – 9518.	*19.*	405073 – 14138.
10.	21073 – 13052.	*20.*	571002 – 1003.

34.—Find the difference between

1.	901 and 109.	*11.*	75263 and 804122.
2.	8256 and 7471.	*12.*	637051 and 746130.
3.	89 and 1052.	*13.*	46721 and 47630.
4.	758 and 6320.	*14.*	83005 and 7981.
5.	53674 and 42775.	*15.*	11542 and 83044.
6.	100100 and 1010.	*16.*	31074 and 136.
7.	1826 and 6370.	*17.*	12345 and 54321.
8.	144 and 7365.	*18.*	401726 and 7138.
9.	5739 and 38046.	*19.*	5160 and 201479.
10.	682 and 2315.	*20.*	121560 and 4672.

35.

1. From eight hundred and seventy-one subtract seven hundred and eighty-one.

2. From two thousand and forty-three subtract one hundred and fifty-two.

3. From six thousand seven hundred and fifty-four subtract seventy-three.

4. Subtract two thousand five hundred and seven from three thousand four hundred.

5. Subtract eight thousand and ninety-four from eleven thousand four hundred and thirty-five.

6. Subtract fifteen hundred and sixty-three from three thousand five hundred and fifty-four.

7. Subtract eleven hundred and thirty-eight from seventeen hundred and sixty.

8. Subtract eight hundred and eleven from two thousand four hundred and eight.

9. Subtract seventy thousand three hundred and six from eighty-one thousand one hundred and four.

10. From thirty thousand and ten take eight hundred and twelve.

11. From three hundred and eighty thousand one hundred and four take fifteen thousand four hundred and seven.

12. From one million five thousand and sixty-seven take fifty-four thousand two hundred and twenty.

13. From twenty-six thousand and thirty-two take six thousand and fifty-one.

14. From twenty-four thousand two hundred and forty take eighteen thousand one hundred and thirty-five.

15. What is the difference between one hundred and twelve thousand three hundred and eight and thirty-three thousand and seventy.

36.

1. What is the difference between twelve million eighty thousand and forty and seven million three hundred and ten thousand and fifty-four.

2. Subtract eleven thousand four hundred and seventy-one from one million nine hundred and sixteen.

3. Subtract five hundred and eighty-nine thousand and three from seven hundred and thirty-one thousand two hundred and one.

4. By how much is three thousand five hundred and seventy greater than seven hundred and seventeen?

5. By how much is one hundred thousand greater than one thousand one hundred?

6. By how much is eleven thousand three hundred and seventeen less than fifty-four thousand three hundred and ninety-four?

7. By how much is forty-seven thousand five hundred and one less than fifty thousand six hundred and eleven?

8. What number must be added to five thousand four hundred and sixty-three to make a million?

9. What number must be added to eighteen thousand and ninety-one to make seventy-nine thousand four hundred and eleven?

10. What number must be added to eight hundred and ninety-six thousand five hundred and twenty to make three millions two hundred thousand and eighty?

11. Subtract thirty-seven millions two hundred and ninety thousand three hundred and six from eighty-six millions five hundred thousand.

12. Subtract eight hundred and eighty-three thousand four hundred and one from two millions six hundred and ten thousand and ten.

13. What is the difference between one hundred and one thousand and ten and one million ten thousand one hundred and one?

14. What is the difference between one million four hundred and fifty and nine hundred and ninety-nine thousand five hundred and thirty-two.

15. What is the difference between two hundred and sixty million eighty-one thousand five hundred and twenty and eighty-nine millions seven hundred thousand nine hundred and sixty-one?

37.

1. Five hundred and sixty-four trees are cut down in a wood containing fifteen thousand and twenty-two; how many are left?

2. A man's income is one thousand pounds a-year, of which he spends seven hundred and thirty-six; how much does he save a-year?

3. If a swarm of bees four thousand and eighty-five in number leave a hive which contained nine thousand seven hundred and six, how many are left?

4. In a certain farm of twelve hundred acres there are five hundred and seventy-nine acres of ploughed land; how much pasture is there?

5. Some boys robbing an orchard found a tree with eight hundred and forty-one apples on it, they took eighty-five; how many were left? On another tree they found four hundred and ten pears, and left on it three hundred and sixty-six; how many did they take?

6. If the population of England be twenty millions two hundred and eleven thousand and forty, and that of Scotland be three millions four hundred thousand eight hundred and ninety-three, how many more people are there in England than in Scotland?

7. A boy gathers eight hundred and twenty-one nuts, of which he gives his brother three hundred and forty, and his sister one hundred and fifty-three; how many does he keep himself?

8. A man born in the year eighteen hundred and thirteen died in eighteen hundred and sixty-four; how old was he at his death?

9. Twenty thousand pounds are required to build a church, of which fifteen thousand four hundred and seventy-eight pounds have been collected; how much more is required?

10. In a town containing one hundred and thirty-six thousand and fifty-one people there are forty thousand seven hundred and eight men; what is the number of women and children?

11. The House of Commons contains six hundred and fifty-two members; of these four hundred and eighty-nine are English and sixty Scotch; how many members are there for Ireland?

12. A merchant bought a cargo of tea for fifteen thousand four hundred and thirty-one pounds and sold it for fifteen thousand nine hundred and seventy pounds; how much profit did he make?

13. Find a number to which if thirty-four thousand three hundred and twenty-six be added the result will be three millions nineteen thousand and five.

14. The greater of two numbers is three thousand one hundred and two; their difference is nine hundred and forty-eight; find the less number.

15. In what year was a man born who died at the age of seventy-two in the year eighteen hundred and sixty-one?

16. My crop of apples and pears numbers eight thousand three hundred and four; of these two thousand and fifty-nine are pears; (1) how many apples have I, and (2) how many more apples than pears?

V.—MULTIPLICATION.

MULTIPLICATION TABLE.

Twice	3 times	4 times	5 times	6 times	7 times
1 are 2	1 are 3	1 are 4	1 are 5	1 are 6	1 are 7
2 „ 4	2 „ 6	2 „ 8	2 „ 10	2 „ 12	2 „ 14
3 „ 6	3 „ 9	3 „ 12	3 „ 15	3 „ 18	3 „ 21
4 „ 8	4 „ 12	4 „ 16	4 „ 20	4 „ 24	4 „ 28
5 „ 10	5 „ 15	5 „ 20	5 „ 25	5 „ 30	5 „ 35
6 „ 12	6 „ 18	6 „ 24	6 „ 30	6 „ 36	6 „ 42
7 „ 14	7 „ 21	7 „ 28	7 „ 35	7 „ 42	7 „ 49
8 „ 16	8 „ 24	8 „ 32	8 „ 40	8 „ 48	8 „ 56
9 „ 18	9 „ 27	9 „ 36	9 „ 45	9 „ 54	9 „ 63
10 „ 20	10 „ 30	10 „ 40	10 „ 50	10 „ 60	10 „ 70
11 „ 22	11 „ 33	11 „ 44	11 „ 55	11 „ 66	11 „ 77
12 „ 24	12 „ 36	12 „ 48	12 „ 60	12 „ 72	12 „ 84

8 times	9 times	10 times	11 times	12 times
1 are 8	1 are 9	1 are 10	1 are 11	1 are 12
2 „ 16	2 „ 18	2 „ 20	2 „ 22	2 „ 24
3 „ 24	3 „ 27	3 „ 30	3 „ 33	3 „ 36
4 „ 32	4 „ 36	4 „ 40	4 „ 44	4 „ 48
5 „ 40	5 „ 45	5 „ 50	5 „ 55	5 „ 60
6 „ 48	6 „ 54	6 „ 60	6 „ 66	6 „ 72
7 „ 56	7 „ 63	7 „ 70	7 „ 77	7 „ 84
8 „ 64	8 „ 72	8 „ 80	8 „ 88	8 „ 96
9 „ 72	9 „ 81	9 „ 90	9 „ 99	9 „ 108
10 „ 80	10 „ 90	10 „ 100	10 „ 110	10 „ 120
11 „ 88	11 „ 99	11 „ 110	11 „ 121	11 „ 132
12 „ 96	12 „ 108	12 „ 120	12 „ 132	12 „ 144

Multiplication is a method of finding the sum of several equal numbers. Thus all multiplication sums *could* be done by addition; for example, to find how much four 6's are, we might add $6+6+6+6$, and we should get 24; but this method would be very inconvenient for large numbers: thus to find 321 times 456 we should have an addition sum of 321 lines. The results of multiplying any number not greater than 12 by any other not greater than 12 are given in the multiplication table above; we shall see that

this table will enable us to multiply *any* number by any other, but we must first prove some preliminary propositions.

The result of multiplying any number as 6 by any other as 4 is the same as the result of multiplying 4 by 6.

The result of multiplying 6 by 4 may be represented by writing 4 rows each of 6 dots. Thus— . . . . . .
the number of dots will then be 4 times . . . . . .
6. But since there are 6 columns . . . . . .
each containing 4 dots, the number is . . . . . .
also 6 times 4. Therefore 4 times 6 is the same as 6 times 4; and the same would be true for any two numbers.

The result of multiplying one of two numbers by the other, or, as it is often called, of multiplying the two numbers together, is called their *product*.

In multiplying two numbers we may divide one of them into any parts we please, and multiply each part separately by the other, and add the results. Thus to take seven 5's is clearly the same as taking three 5's and four 5's and adding them together.

Hence we may divide a number to be multiplied into units, tens, &c., and multiply each separately. For example, to multiply 382 by 4.

382 is 3 hundreds, 8 tens, 2 units.

Therefore we get 12 hundreds, 32 tens, 8 units.

Or, since 32 tens is 3 hundreds, 2 tens,

We have 15 hundreds, 2 tens, and 8 units, or 1528.

In working such a sum as the above, the result only is written down figure by figure, the work being all done mentally. Thus the above sum is written—

382
4

1528

The mental work being something like this. "Four 2's are 8:"—put down 8. "Four 8's are 32:"—put down 2 and carry 3. "Four 3's are 12, and 3 (which was carried) are 15:"—put down 15.

38.

1.	23416×2	*8.*	57802×2	*15.*	62819×5
2.	45613×4	*9.*	80135×5	*16.*	93856×6
3.	34520×3	*10.*	91246×6	*17.*	28475×4
4.	56042×5	*11.*	12357×3	*18.*	39586×5
5.	21264×2	*12.*	23460×6	*19.*	40697×6
6.	60153×6	*13.*	68913×3	*20.*	17364×3
7.	32305×5	*14.*	57802×2	*21.*	51708×4

39.

1.	437958×7.	*8.*	548069×8.	*15.*	760281×9.
2.	760281×11.	*9.*	871392×12.	*16.*	104748×7.
3.	193514×8.	*10.*	204625×9.	*17.*	327071×11.
4.	426847×12.	*11.*	537958×7.	*18.*	650304×8.
5.	859170×9.	*12.*	960281×11.	*19.*	382637×12.
6.	482403×7.	*13.*	593514×8.	*20.*	616960×9.
7.	715736×11.	*14.*	926847×12.	*21.*	438182×7.

40.—Multiply—

1.	4035718 by 2, 5, 8.		*6.*	42368190 by 8, 7, 12.	
2.	5189024 „ 3, 6, 7.		*7.*	51870032 „ 6, 3, 5.	
3.	4210650 „ 9, 11, 12.		*8.*	20368910 „ 2, 4, 9.	
4.	6341796 „ 5, 4, 11.		*9.*	63074051 „ 11, 7, 3.	
5.	7234561 „ 8, 3, 4.		*10.*	42167509 „ 8, 7, 12.	

We have seen, p. 9, that placing a 0 at the end of a number increases tenfold the value of each figure in the number, hence it is the same as multiplying the whole number by 10. So also placing two 0's after a number multiplies it by 100, and so on.

To multiply by a number which is the product of two others, we may multiply first by one of those numbers and then multiply the result by the other. Thus to take 56 times any number is the same as taking 7 times 8 times that number, *i.e.*, we may multiply first by 8 and then by 7.

Thus to multiply by a number like 600 or 6 times 100, we may multiply by 6 and then multiply the result by 100, which is done by adding two 0's to the end of it.

Example.—Multiply 5364 by 7000.

5364
7000

37548000

As many 0's are first written down as there are in the multiplier, and then the result of multiplying 5364 by 7 in the ordinary manner.

41.

1. 54327 × 10.	*7.* 26750 × 90.	*13.* 71200 × 110.
2. 32940 × 10.	*8.* 37863 × 40.	*14.* 37864 × 3000.
3. 58351 × 100.	*9.* 59472 × 50.	*15.* 59086 × 7000.
4. 3456 × 1000.	*10.* 7169 × 120.	*16.* 71208 × 1100.
5. 59074 × 20.	*11.* 8342 × 800.	*17.* 15300 × 9000.
6. 82307 × 70.	*12.* 9340 × 700.	*18.* 1090 × 20000.

We are now in a position to multiply by any number, for we may by the principle stated on p. 39 split up the multiplier into units, tens, &c., and, multiplying by each separately, add the result.

Example.—Multiply 7132 by 642. We may multiply by 2, 40, and 600, and add the results. Thus—

7132
642

14264 which is 7132 × 2
285280 „ 7132 × 40
4279200 „ 7132 × 600

4578744

The 0's at the ends of the lines in the above working are usually omitted, and the sum is written thus—

Each line of multiplication is set down so that its last figure is directly under the corresponding figure of the multiplier.

7132
642

14264
28528
42792

4578744

42.

1.	3714820 × 23.	*12.*	2167501 × 89.
2.	4948585 × 15.	*13.*	8392146 × 27.
3.	5172043 × 31.	*14.*	4501960 × 99.
4.	6306901 × 82.	*15.*	9234137 × 42.
5.	7530607 × 53.	*16.*	7326855 × 56.
6.	8764350 × 17.	*17.*	5001389 × 75.
7.	1537086 × 45.	*18.*	1465037 × 86.
8.	2761542 × 28.	*19.*	3081742 × 49.
9.	8500369 × 93.	*20.*	2130561 × 57.
10.	7423110 × 72.	*21.*	5302713 × 47.
11.	6089318 × 64.	*22.*	6305106 × 65.

43.

1.	3246132 × 235.	*12.*	3640118 × 873.
2.	8357106 × 624.	*13.*	5706180 × 264.
3.	3467870 × 273.	*14.*	3584009 × 735.
4.	6035710 × 581.	*15.*	7035816 × 338.
5.	3634227 × 649.	*16.*	8146927 × 459.
6.	1584902 × 126.	*17.*	9370475 × 568.
7.	7949267 × 315.	*18.*	9817836 × 897.
8.	3253104 × 373.	*19.*	1082761 × 527.
9.	2809682 × 394.	*20.*	3850619 × 692.
10.	6412793 × 716.	*21.*	3075612 × 413.
11.	8191531 × 924.	*22.*	7412803 × 627.

44.

1.	413572 × 3241.	*11.*	628462 × 34761.
2.	635794 × 5163.	*12.*	128035 × 95143.
3.	857916 × 7312.	*13.*	306417 × 71623.
4.	103695 × 4931.	*14.*	512320 × 11725.
5.	658150 × 1734.	*15.*	400179 × 35214.
6.	771506 × 8126.	*16.*	813265 × 47681.
7.	894932 × 3572.	*17.*	835076 × 95346.
8.	570036 × 1214.	*18.*	917602 × 18321.
9.	834200 × 3384.	*19.*	135680 × 17952.
10.	719351 × 2142.	*20.*	873264 × 42379.

45.

1.	76541 × 510.	*11.*	748123 × 7130.
2.	8134 × 7800.	*12.*	470039 × 65700.
3.	713406 × 390.	*13.*	591376 × 76400.
4.	300740 × 890.	*14.*	29863 × 623700.
5.	63794 × 760.	*15.*	700320 × 98360.
6.	538427 × 8300.	*16.*	76020 × 834500.
7.	731200 × 250.	*17.*	734600 × 917600.
8.	38000 × 8400.	*18.*	342065 × 83470.
9.	56789 × 6510.	*19.*	200810 × 115600.
10.	321570 × 1370.	*20.*	239000 × 715400.

46.

1.	579243 × 605.	*13.*	43875 × 60302.
2.	260769 × 702.	*14.*	308216 × 9405.
3.	760057 × 3040.	*15.*	728436 × 8030.
4.	532871 × 6031.	*16.*	830057 × 91003.
5.	130852 × 1002.	*17.*	724306 × 70062.
6.	713002 × 5903.	*18.*	813900 × 40300.
7.	470392 × 3071.	*19.*	385214 × 740030.
8.	531847 × 7605.	*20.*	306041 × 10001.
9.	830705 × 3076.	*21.*	345600 × 500062.
10.	764321 × 73602.	*22.*	605034 × 703002.
11.	106352 × 20394.	*23.*	349160 × 763004.
12.	62057 × 71060.	*24.*	300798 × 900056.

47.—Show that the product of the three numbers in any row or column of the following square is 123417546.

411	482	623
1687	267	274
178	959	723

48.

1. Multiply seven thousand six hundred and one by seven.

2. Multiply thirteen hundred and eighty-four by eleven and twelve in succession.

3. Multiply together two, three, four, five, six, seven, eight, nine, and ten.

4. Find the product of three hundred and forty-seven and five hundred and eighty-three.

5. Find the product of twelve thousand and three and three thousand and twelve.

6. How much is twelve times four times three thousand four hundred and seven?

7. Multiply together three thousand three hundred, three thousand and thirty, and three thousand and three.

8. Find the *square* of six hundred and seventy-nine.

N.B.—The *square* of a number is that number multiplied by itself.

9. Find the square of two thousand seven hundred and forty-seven.

10. Find the square of seventeen hundred.

11. Multiply three millions seventeen thousand and ninety by four thousand and eighty-four.

12. Multiply the square of two hundred and thirty-nine by eleven.

13. Find the product of one thousand three hundred and fifty-six, five hundred and seventy-eight, and two hundred and fifty.

14. Multiply the square of seventeen by the square of nineteen.

15. Multiply together twenty-one, twenty-two, twenty-three, twenty-four, twenty-five.

49.

1. How many days are there in fifty-two weeks?

2. If it takes twelve thousand five hundred and four bricks to build a certain cottage, how many will be required to build thirteen such?

3. If a boy eats nineteen lolipops in a day, how many will he eat in a year of three hundred and sixty-five days?

4. A sovereign is equal to nine hundred and sixty farthings; how many farthings are there in three hundred and forty sovereigns?

5. In a field of turnips there are one hundred and thirty-seven rows, and in each row three hundred and eight turnips; how many are there in the whole field?

6. A gross is twelve dozen; how many pens are there in one hundred and forty-nine gross?

7. If there are nine nails in a horse's shoe, how many nails will be required to shoe four hundred and eighty-one horses?

8. How many passengers can ride in a railway train of thirteen carriages, if each carriage has five compartments, and each compartment holds ten people?

9. In a factory there are eight rooms; each room has twelve windows, each window contains twenty-four panes of glass; how many panes of glass are there in the whole factory?

10. In a book of one hundred and fifteen pages there are forty-three lines on a page and thirty-eight letters in a line; how many letters are there in the whole book?

11. If seventy-five thousand drops of rain make a gallon of water, how many drops will be required to fill a tub holding fifty-four gallons?

12. Each seed-pod of a certain plant contains three hundred and seventy seeds; if each of a dozen plants produce thirty-two such pods, how many seeds are produced by the lot?

VI.—SHORT DIVISION.

Division is the process of finding how often one number is contained in another.

We *could* work all division sums by repeated subtractions; thus to find how often 8 is contained in 37 we might arrange the process as in the margin, by which we see that 8 can be subtracted four times from 37 and 5 remains, or 37 contains four 8's and 5.

37
8
—
29
8
—
21
8
—
13
8
—
5

The multiplication table will enable us to shorten the work by making several of the subtractions at once; thus since we know that 4 times 8 are 32, we may take 32 from 37 and there remains 5, or, as before, 37 contains 4 8's and 5.

The same principle of doing a large number of subtractions at once may be applied to work more complicated examples. Thus to find how often 6 is contained in 17356 we might arrange the process as below.

17356		
12000	or 2000	× 6
5356		
4800	or 800	× 6
556		
540	or 90	× 6
16		
12	or 2	× 6
4		

Here we have first subtracted as many thousands of 6's as possible, viz., 2000 times 6; from the remainder, 5356, as many hundreds of 6's as possible, viz. 800 6's, and so

on, and we finally get the remainder 4, having subtracted 2892 6's; therefore 17356 contains 2892 6's and 4. Instead of writing down the whole process in full as above, the greater part of it is usually done mentally when dividing by a number not greater than 12, and only the result written down figure by figure, thus—

$$6)17356$$
$$2892—4$$

The mental work being like this—

"6's into 17?—twice 6 are 12 and 5 over." Put down 2 and carry 5. "6's into 53?—8 6's are 48 and 5 over." Put down 8 and carry 5. 6's into 55?—9 6's are 54 and 1 over." Put down 9 and carry 1. "6's into 16?—twice 6 are 12 and 4 over." Put down 2 and 4 is over.

This process is called *short division.*

The number to be divided is called the *dividend*, that by which we divide the *divisor*, and the result which tells us how often the divisor is contained in the dividend the *quotient* (Lat. *quoties;* how often?). When the divisor is not contained an exact number of times in the dividend, what is left over is called the *remainder.* The product of the divisor and quotient added to the remainder gives the dividend.

If there be no remainder, and we make a new sum, using our former quotient for divisor, we shall have our former divisor for quotient; thus 40 divided by 8 gives quotient 5, and 40 divided by 5 gives quotient 8, *i.e.*, 5 is that number which is contained 8 times in 40, or we find the 8th part of 40 by dividing by 8. The aspect of division here introduced is quite distinct from that with which we started, viz., that it is a process of subtraction; the distinction will be seen more clearly when we come to deal with concrete quantities. It will be enough to observe here that regarding division as an answer to the question, how often is the divisor contained in the dividend? the divisor and dividend must be concrete numbers *of the same*

kind (it would be absurd to ask how often 4 oranges are contained in 12 penny whistles), and the quotient is an abstract number.

If we are finding a certain part of a number by division, the divisor is an abstract number, and the quotient a concrete number of the same kind as the dividend.

If there be a remainder, we cannot apply division to find a part of a given number without the aid of fractions. Thus to find the 7th part of 24 apples: we know that 7 times 3 apples are 21 apples, and 7 times 4 apples are 28 apples; thus the 7th part of 24 apples is something between 3 and 4 apples, *i.e.*, it is 3 apples and a piece of an apple; how large this piece is we cannot at present find.

The sign ÷ placed between two numbers means that the former is to be divided by the latter.

50.

1. 35082 ÷ 2.	*7.* 510035 ÷ 5.	*13.* 76325 ÷ 5.
2. 75681 ÷ 3.	*8.* 563712 ÷ 6.	*14.* 72006 ÷ 6.
3. 39464 ÷ 4.	*9.* 73801 ÷ 7.	*15.* 90364 ÷ 8.
4. 83470 ÷ 5.	*10.* 35400 ÷ 8.	*16.* 69454 ÷ 11.
5. 79242 ÷ 3.	*11.* 41004 ÷ 9.	*17.* 31392 ÷ 12.
6. 76548 ÷ 4.	*12.* 49108 ÷ 4.	*18.* 79317 ÷ 7.

51.

1. 3562041 ÷ 2.	*12.* 3760396 ÷ 5.
2. 8723435 ÷ 3.	*13.* 9837243 ÷ 6.
3. 1506726 ÷ 4.	*14.* 2900689 ÷ 7.
4. 3700563 ÷ 5.	*15.* 8300741 ÷ 4.
5. 8304904 ÷ 6.	*16.* 1830793 ÷ 5.
6. 1724309 ÷ 3.	*17.* 1900000 ÷ 6.
7. 4320637 ÷ 4.	*18.* 2349080 ÷ 7.
8. 1304726 ÷ 5.	*19.* 5037642 ÷ 8.
9. 7359018 ÷ 6.	*20.* 3004593 ÷ 7.
10. 3012873 ÷ 2.	*21.* 7403482 ÷ 3.
11. 4537429 ÷ 4.	*22.* 5380477 ÷ 5.

52.

1.	2718065 ÷ 8.	*11.*	3706823 ÷ 9.
2.	7893201 ÷ 9.	*12.*	6175802 ÷ 11.
3.	5013487 ÷ 6.	*13.*	8160937 ÷ 12.
4.	3920384 ÷ 7.	*14.*	5117284 ÷ 7.
5.	8372146 ÷ 8.	*15.*	4465037 ÷ 8.
6.	4365984 ÷ 9.	*16.*	7600356 ÷ 9.
7.	453678 ÷ 11.	*17.*	3978420 ÷ 7.
8.	1496583 ÷ 12.	*18.*	4301765 ÷ 8.
9.	5703214 ÷ 7.	*19.*	7400804 ÷ 9.
10.	6183420 ÷ 8.	*20.*	4230569 ÷ 11.

53.

1.	7814873 ÷ 11.	*6.*	2314205 ÷ 12.
2.	7076217 ÷ 12.	*7.*	3274604 ÷ 11.
3.	1275923 ÷ 11.	*8.*	4677021 ÷ 12.
4.	11330434 ÷ 12.	*9.*	8570198 ÷ 11.
5.	41241154 ÷ 11.	*10.*	5891270 ÷ 12.

Division by 10, 100, 1000, &c. If we cut off the last figure of a number, the remaining figures indicate the number of clear tens there are in it; if we cut off the last two figures, the rest give the number of clear hundreds in it. Hence to divide by 10, 100, 1000, &c, all we need do is to cut off the last one, two, three, &c., figures of the dividend, the remaining figures give the quotient, and those cut off the remainder. For example, 17803 contains 178 hundreds and 3.

54.

1.	73564 ÷ 10.	*7.*	532160 ÷ 1000.
2.	80370 ÷ 10.	*8.*	7103008 ÷ 1000.
3.	130875 ÷ 100.	*9.*	635400 ÷ 1000.
4.	53804 ÷ 100.	*10.*	2793648 ÷ 10000.
5.	75380 ÷ 100.	*11.*	34580 ÷ 10000.
6.	513756 ÷ 1000.	*12.*	7000000 ÷ 1000.

55.—Divide—

1.	27118728	by	2,	3,	12,	9.
2.	15206840	„	4,	5,	11,	8.
3.	1866480	„	6,	8,	10,	7.
4.	1623384	„	7,	9,	8,	6.
5.	1710170	„	10,	11,	7,	5.
6.	7515144	„	2,	3,	6,	4.
7.	14918760	„	4,	5,	9,	3.
8.	4878762	„	6,	7,	3,	2.
9.	72793440	„	8,	9,	2,	10.
10.	1116360	„	10,	2,	12,	9.
11.	12279960	„	3,	4,	9,	10.
12.	1599840	„	5,	6,	12,	8.

56.—Divide—

1.	542653	by	7,	8,	3,	4.
2.	7603573	„	9,	10,	6,	8.
3.	2686457	„	7,	9,	2,	3.
4.	5504697	„	5,	8,	4,	10.
5.	1866499	„	3,	7,	6,	8.
6.	8079127	„	10,	6,	8,	9.
7.	1812837	„	8,	5,	10,	11.
8.	4395691	„	5,	9,	11,	12.
9.	7129213	„	6,	10,	12,	4.
10.	15838067	„	7,	11,	3,	5.
11.	2122661	„	8,	12,	4,	6.
12.	3846476	„	9,	3,	5,	7.

Division by a number which is the product of two others. If the divisor is the product of two other numbers, neither being greater than 12, we may divide by each of them separately. The method will be best explained by an example.

Divide 6457 by 63, or 9 times 7. Dividing first by 7 we get 922 and 3 over, or 6457 contains 922 7's and 3. Now of these 922 7's each 9 makes 63, hence if we divide 922 by 9 we shall

have the number of 63's in 6457 ; we get 102 and 4 over, that is, 922 7's contain 102 63's and 4 7's or 28 over, which, with our former remainder of 3, gives for the complete remainder 28+3 or 31. The process would be written thus—

$$\left.\begin{array}{l} 7)6457 \\ 9)922\text{—}3 \\ \quad 102\text{—}4 \end{array}\right\} 31$$

the complete remainder 31 is formed by multiplying the last remainder 4 by the first divisor 7, and adding the first remainder 3.

A simple and very useful case of the above is when one factor of the divisor is 10, 100, &c. Thus to divide 8394 by 700.

$$\begin{array}{l} 7,00)83,94 \\ \quad 11\text{—}694 \end{array}$$

Here 8394 has been first divided by 100 by cutting off the last two figures, as explained above ; then the quotient 83 has been divided by 7, and the remainder 6, meaning 6 hundreds, has been added to 94, the first remainder, giving the complete remainder 694.

57.

1.	$436899 \div 14$.	*15.*	$8137453 \div 54$.
2.	$300527 \div 18$.	*16.*	$1354271 \div 55$.
3.	$8307611 \div 16$.	*17.*	$430700 \div 81$.
4.	$439205 \div 21$.	*18.*	$5632104 \div 64$.
5.	$4031729 \div 24$.	*19.*	$1307561 \div 72$.
6.	$843043 \div 25$.	*20.*	$4109876 \div 84$.
7.	$7390478 \div 28$.	*21.*	$4357061 \div 45$.
8.	$736255 \div 42$.	*22.*	$2890376 \div 77$.
9.	$6310972 \div 49$.	*23.*	$4730000 \div 99$.
10.	$5084263 \div 35$.	*24.*	$8107642 \div 63$.
11.	$5083753 \div 48$.	*25.*	$1000000 \div 108$.
12.	$6230749 \div 56$.	*26.*	$7356205 \div 121$.
13.	$4003767 \div 36$.	*27.*	$4370896 \div 132$.
14.	$5726009 \div 44$.	*28.*	$5034276 \div 144$.

58.

1.	3650754 ÷ 40.	*11.*	9362849 ÷ 500.
2.	3836203 ÷ 60.	*12.*	8492000 ÷ 300.
3.	4309425 ÷ 70.	*13.*	13798202 ÷ 600.
4.	15309678 ÷ 80.	*14.*	73624891 ÷ 5000.
5.	7306597 ÷ 30.	*15.*	13029870 ÷ 9000.
6.	18307606 ÷ 50.	*16.*	43896074 ÷ 1200.
7.	63429000 ÷ 90.	*17.*	89103652 ÷ 700.
8.	42371042 ÷ 20.	*18.*	43260835 ÷ 800.
9.	13052764 ÷ 110.	*19.*	429000000 ÷ 3000.
10.	43970381 ÷ 120.	*20.*	1837692001 ÷ 5000.

59.

1. Seven hundred and eighty-four nuts are to be divided equally among eight boys; how many will each receive?

2. What is the eighth part of forty-six thousand four hundred and seventy-two?

3. How many weeks are there in three hundred and forty-three days?

4. How often is twelve contained in forty-two thousand seven hundred and eight?

5. There are twenty shillings in a sovereign; how many sovereigns and how many shillings over are there in five thousand and thirty-one shillings?

6. What number is contained nine times in seven hundred and seventy-four thousand one hundred and eight?

7. A man has five thousand six hundred and eighty-eight apples, which he sells at six a-penny. How many pennies does he receive? How many shillings are these equal to if twelve pence make a shilling?

8. Seven hundred and eight soldiers are drawn up in two rows; how many are there in each row? How many would there be in a row if they were drawn up in four rows? How many if in six rows?

9. There are twelve pence in a shilling; how many shillings are there in forty-two thousand three hundred and twelve pence?

10. A gardener wishes to plant ten equal rows of cabbages; he has three hundred and twenty-one plants: how many must he put in a row and how many will be left?

11. How many dozen oranges are there in a case containing five hundred and eighty-five?

12. How many times can eight be subtracted from one hundred thousand one hundred?

13. In four thousand four hundred and thirty-eight apples it is found that one in every seven is bad; how many are bad altogether?

14. Find the third, seventh, and eleventh parts of twenty-seven thousand nine hundred and fifty-one.

15. A man died and left twenty-six thousand one hundred pounds to be divided between his wife, his son, and his daughter; his wife was to have one-half, his son one-third, his daughter one-sixth part of the whole: how much did each receive?

16. How many hours will a railway train travelling thirty miles an hour take to go five hundred and ten miles?

17. Find the tenth, thirtieth, and fortieth parts of one hundred and one thousand two hundred and eighty pounds.

18. If an ox cost twelve pounds, how many can be bought for three thousand nine hundred pounds?

19. What is the least number that can be taken from ninety-two thousand eight hundred in order that the remainder may be divided into eleven equal parts? How much will each part be?

VII.—LONG DIVISION.

If the divisor is any number greater than 12 we may use the process of *long division*, which only differs from the short method above explained in that all the working is put down, and not only the answer.

Thus to divide 19674 by 83, we have

$$\begin{array}{rl} 19674 & \\ 16600 & = 200 \times 83 \\ \hline 3074 & \\ 2490 & = 30 \times 83 \\ \hline 584 & \\ 581 & = 7 \times 83 \\ \hline 3 & \end{array}$$

That is, we can subtract 237 times 83 from 19674, and 3 remains. As ordinarily written, the sum would be—

$$\begin{array}{r} 83)19674(237 \\ 166 \\ \hline 307 \\ 249 \\ \hline 584 \\ 581 \\ \hline 3 \end{array}$$

which differs from the above only in leaving out superfluous 0's and in bringing down only one figure of the dividend at a time, instead of writing down the complete remainder at each step. For the first figure 2 of the quotient we divide 83 into 196, *i.e.*, the least number taken from the left of the dividend, which is greater than 83; to the remainder 30 we affix the next figure of the dividend, and now divide 83 into 307, and so on, until all the figures of the dividend have been brought down.

60.

1.	23328 ÷ 72.	*11.*	203456 ÷ 32.
2.	10557 ÷ 17.	*12.*	144759 ÷ 73.
3.	5661 ÷ 51.	*13.*	218736 ÷ 28.
4.	13824 ÷ 32.	*14.*	2034340 ÷ 35.
5.	35316 ÷ 54.	*15.*	3342975 ÷ 87.
6.	23349 ÷ 43.	*16.*	5308182 ÷ 57.
7.	49725 ÷ 65.	*17.*	1579356 ÷ 19.
8.	84796 ÷ 86.	*18.*	2520366 ÷ 37.
9.	56225 ÷ 65.	*19.*	3121043 ÷ 41.
10.	69192 ÷ 72.	*20.*	7913303 ÷ 83.

61.

1.	94095 ÷ 765.	*11.*	2470146 ÷ 721.
2.	151348 ÷ 482.	*12.*	4226475 ÷ 825.
3.	262104 ÷ 489.	*13.*	2029048 ÷ 532.
4.	136313 ÷ 503.	*14.*	3034629 ÷ 701.
5.	44772 ÷ 182.	*15.*	3669561 ÷ 441.
6.	277233 ÷ 341.	*16.*	1014966 ÷ 113.
7.	606712 ÷ 838.	*17.*	2597720 ÷ 808.
8.	642115 ÷ 769.	*18.*	2305647 ÷ 723.
9.	205024 ÷ 596.	*19.*	1032993 ÷ 327.
10.	715716 ÷ 846.	*20.*	1810109 ÷ 371.

62.

1.	5164965 ÷ 3159.	*11.*	7341727 ÷ 29.
2.	4131972 ÷ 6318.	*12.*	6999307 ÷ 83.
3.	9050545 ÷ 4879.	*13.*	16761888 ÷ 312.
4.	279936 ÷ 1944.	*14.*	94014589 ÷ 103.
5.	3105135 ÷ 1353.	*15.*	47160192 ÷ 382.
6.	2421568 ÷ 1256.	*16.*	602526912 ÷ 832.
7.	25948296 ÷ 48411.	*17.*	131599614 ÷ 717.
8.	61645346 ÷ 73213.	*18.*	697692488 ÷ 92.
9.	19243375 ÷ 49725.	*19.*	31622146 ÷ 113.
10.	14708596 ÷ 25316.	*20.*	217973896 ÷ 521.

63.

1.	314160 ÷ 84.	*11.*	329656 ÷ 89.
2.	7242800 ÷ 76.	*12.*	1456114 ÷ 121.
3.	1042500 ÷ 125.	*13.*	1690650 ÷ 13.
4.	18130800 ÷ 521.	*14.*	61110196 ÷ 763.
5.	3784300 ÷ 205.	*15.*	11362478 ÷ 37.
6.	98524700 ÷ 113.	*16.*	393754060 ÷ 562.
7.	116708000 ÷ 815.	*17.*	31052070 ÷ 345.
8.	465920000 ÷ 128.	*18.*	205299260 ÷ 821.
9.	359058000 ÷ 4326.	*19.*	305858140 ÷ 602.
10.	550440000 ÷ 1529.	*20.*	158090310 ÷ 7635.

64.—Find the quotient and remainder of—

1.	63725 ÷ 95.	*11.*	32173363 ÷ 746.
2.	1037461 ÷ 224.	*12.*	58703121 ÷ 1232.
3.	8505367 ÷ 504.	*13.*	43621700 ÷ 797.
4.	7213985 ÷ 69.	*14.*	13842079 ÷ 2799.
5.	6123740 ÷ 372.	*15.*	654321012 ÷ 553.
6.	26310000 ÷ 264.	*16.*	43860017 ÷ 1206.
7.	43716912 ÷ 1431.	*17.*	53723459 ÷ 43726.
8.	246810120 ÷ 7131.	*18.*	788013251 ÷ 9231.
9.	70986321 ÷ 6243.	*19.*	499007617 ÷ 43102.
10.	837000000 ÷ 5678.	*20.*	563401721 ÷ 5635.

When the divisor ends in one or more 0's, some writing may be saved by cutting them off, and also marking off an equal number of figures from the dividend, which must afterwards be annexed to the remainder.

Example.—Divide 834261 by 7200. We proceed thus—

```
61,00) 934,26 (15
       61
       ---
       324
       305
       ---
        19,26
```

Therefore the quotient is 15 and the remainder 1926.

65.

1.	796532 ÷ 230.	*8.*	58321460 ÷ 17300.
2.	80017251 ÷ 1700.	*9.*	72300000 ÷ 8400.
3.	41032378 ÷ 6320.	*10.*	3141675 ÷ 37400.
4.	75432061 ÷ 4080.	*11.*	21819165 ÷ 51340.
5.	18374657 ÷ 63000.	*12.*	170063240 ÷ 75060.
6.	50070832 ÷ 73100.	*13.*	8000000 ÷ 290.
7.	76215384 ÷ 2360.	*14.*	7863240 ÷ 17000.

66.

1. How many times is nineteen contained in seventeen thousand three hundred and nine?

2. A certain steamship burns forty-three tons of coal per day; how many days will fifteen hundred and ninety-one tons last her?

3. How many times can three hundred and one be subtracted from three million? and what will be the remainder?

4. How many companies of 53 men each can be formed out of five thousand eight hundred and thirty men?

5. If two hundred and forty pence make one pound, how many pounds and how many pence over are there in ninety-five thousand pence?

6. Find the remainder when three millions eight hundred and eleven thousand is divided by five thousand and one.

7. How many tin cases, each holding two hundred and forty-four biscuits, will be required to pack one hundred and seventy-one thousand five hundred and thirty-two?

8. If the dividend be forty-three thousand five hundred and three and the divisor be eighty-two, find the quotient and remainder.

9. In a certain town one person out of every thirty-one dies per year; how many deaths are there in a year in the town if the whole population be twenty-two thousand four hundred and forty-four?

10. What number multiplied by eighteen hundred and nine gives two hundred and thirty-six thousand nine hundred and seventy-nine?

11. In a battle two hundred and five thousand six hundred and seventy-two cartridges are used by four thousand three hundred and seventy-six soldiers; how many is that to each man?

12. What is the thirty-fourth part of one hundred and seventy thousand two hundred and thirty-eight?

13. If an ox cost seventeen pounds, how many such can be bought for four thousand and forty-six pounds?

14. How many trains, each carrying thirteen hundred and twenty-one men, will be required to convey an army of one hundred and forty-one thousand three hundred and forty-seven?

15. What number multiplied by five hundred and four will make one million five hundred and twenty-four thousand six hundred?

16. If a man walks seventy-nine miles in one hundred and sixty-four thousand five hundred and fifty-seven steps, how many steps does he take to the mile?

17. A river discharges twenty-five thousand gallons of water a minute; how long will it take to discharge four million gallons?

18. If thirty-one houses be bought for twenty-three thousand six hundred and fifty-three pounds, how much does one cost?

19. A farm of eight hundred and fifty acres is bought for forty-seven thousand seven hundred and fifty pounds; how much did it cost an acre?

20. If one hundred and nineteen cherries be required to make a pie, how many pies could be made from thirteen thousand and ninety cherries?

21. How often can seven thousand and seven be sub-

tracted from a million, and what will be the last remainder?

22. A man has a heap of three thousand seven hundred and eighty-five apples in his orchard; how many journeys must he make to bring them into his house in a basket holding two hundred and seventeen, and how many will he bring his last journey?

MISCELLANEOUS EXAMPLES.

1. Add together the sum and difference of 7362 and 19376.

2. What is the value of $5308 + 7351 - 6284$?

3. Three boys go nutting; the first picks 252, the second 139, the third 314; they agree to divide the whole number equally. How many does each get?

4. Express in words the difference between 803851 and 753246.

5. What is the difference between the value of 84 horses worth 32 pounds each, and 181 bullocks worth 14 pounds each?

6. Divide the product of 588 and 528 by 21.

7. What number is that from which, if 38 be subtracted, the remainder is equal to three times 59?

8. How many times does a clock which strikes the hours sound in a day? How many times in a week?

9. Multiply the sum of 1387 and 1596 by the difference of the same two numbers.

10. Find the value of $5389 - 4297 + 6341$.

11. In a school there are three classes; in the first there are 25 children, in the second 31, and in the third 32. If the whole school were equally divided into four classes, how many would there be in each?

12. Divide the product of 348 and 558 by the difference between 789 and 1050.

13. A farmer has 84 acres of turnips, twice as much corn, and three times as much pasture land; of how many acres does his farm consist?

14. Add together the third, fourth, fifth, and sixth parts of 45120.

15. Three men, A, B, & C, are partners, and agree that of all profits they make A shall take one-third part, B one-fourth, and C the remainder; what are their shares of a profit of 588 pounds?

16. Find the difference between the ninth and fifth parts of 171045.

17. A man having to take a journey of 414 miles goes half the distance by rail, one-sixth of the distance by coach, the remainder on foot; how far does he walk?

18. What number is that to which, if 17 be added, the result is five times 384?

19. In a regiment of soldiers there is one officer to 19 privates; if there are 779 privates in the regiment, what is the whole number of officers and men?

20. What number added to the product of 327 and 89 will give 30000?

21. A man's income is 398 pounds a-year; if he spends each year 256 pounds, how much will he save in 12 years?

22. Divide the sum of 5168 and 5206 by three times their difference.

23. 15031 copies of a certain newspaper are sold on Saturday and 12937 on each other week-day; how many are sold in a week?

24. Find the sum of all the numbers from 1 to 20 inclusive.

25. Find the value of $8376 \times 98 + 6738 \times 72$.

26. A man left 14389 pounds to be divided as follows: to his widow 5000 pounds, to his son 4000, to each of four

servants 100 pounds, and the rest to be divided equally among his three daughters; how much did each daughter receive?

27. Divide the product of the numbers 20, 21, 22, 23 by the product of 2, 3, 4, and 5.

28. In a certain town the children form half the population; there are 4591 men, and 238 more women than men; find the whole population?

29. Multiply the sum of 874 and 609 by their difference, and subtract 83091 from the result.

30. Divide 263 nuts between two boys so that one may have 25 more than the other.

31. If a man was born in the year 1851, how old will he be in the year 1894?

32. Find the value of $83 \times 762 \times 91 - 6087$.

33. A man owed 732 pounds; if he paid back at one time one-sixth part of the sum, at another time one-fourth, and at another time 263 pounds; how much does he still owe?

34. Find a number such that when the sum of 89 and 256 is subtracted from it the remainder is 12 times 399.

35. For 21 oxen and 43 sheep a farmer received 401 pounds; the sheep were sold at 2 pounds each: what was the price of each ox?

36. If 563 be multiplied by a certain number, and 1043 be added, the result is 23000: find the number.

37. Out of 19635 soldiers engaged in a battle one in 35 is killed, one in 17 is wounded, and 536 are taken prisoners; what is the whole loss?

38. Multiply the sum of the ninth and eleventh parts of 12276 by the difference between the fourth and fifth parts of the same number.

39. How many boxes, each holding six dozen pens, can be filled from 18 parcels, each containing 3124?

40. To a family of 9 children a gentleman distributes

pennies as follows: one penny to the youngest, twopence to the youngest but one, fourpence to the next eldest, eightpence to the next, and so on; how many pennies will he require?

41. Divide the product of 10846 and 19159 by 391.

42. A man plants in his garden 34 rows of cabbages, there being 19 plants in each row; how many rows could he have planted with the same number of cabbages if he had put only 17 in a row?

43. If 356 be subtracted 27 times from 10000, what will be the remainder?

44. A railway train going at the rate of 35 miles in an hour makes a certain journey in 12 hours; what is the distance travelled, and how long would the journey have taken had the train only gone 28 miles an hour?

45. Find the product of all the numbers from 2 to 12 inclusive.

46. A book of six volumes contains in each volume 384 pages, each page contains 35 lines; in the whole book there are 631680 letters: how many letters are there in each line on the average?

47. As I was coming from St. Ives,
I met a man with seven wives;
Each wife had seven sacks,
In each sack were seven cats,
Each cat had seven kits,
Each kit had seven rats:
Cats, kittens, rats, and wives,
How many were there going to St. Ives?

48. There are twenty-four sheets of paper in a quire; how many sheets are there in three dozen packets, each containing five quires?

49. If 231 blackberries make 1 pint, how many must a boy gather to fill a basket holding 13 pints; and if he takes 7 hours to do it, how many does he gather in an hour?

50. An engine driver makes a journey of 184 miles every day; how far does he travel in a year?

51. A church contains 46 pews holding 6 people in each, and 28 holding 4 each; how many people does the whole church contain?

52. If on the average 6 peas grow in one pod, and 552 peas fill a pint measure, how many pods must be gathered to give 7 pints when shelled?

53. 63 nails weigh one pound; if I buy 11 pounds, and use 531, how many shall I have left?

54. Find a number to which, if three thousand one hundred and five be added, the result is seven times nine hundred and forty-one.

55. Ten children go nutting; each gathers three hundred and forty-seven; they eat while they are out one thousand and sixteen: how many do they bring home?

56. Find a number which, when multiplied by thirty-seven, is equal to four times one thousand eight hundred and eighty-seven.

57. A school of two hundred and eighty-one children contains three classes of forty each, four of thirty-five, and one other; how many are there in this last class?

58. Add together the third part of three hundred and forty-five thousand seven hundred and two, and three times the same number.

59. Find a number whose double exceeds one thousand by three times seven hundred and fourteen.

60. How many cartridges will be required to supply an army of eleven thousand four hundred and sixty men for thirty-one days, allowing seventeen cartridges for each man per day?

61. If 23 be subtracted as often as possible from 73524, what will be the final remainder?

62. A regiment numbers one thousand and fourteen, of

which thirty-nine are officers; how many men are there to each officer?

63. A carriage wheel revolves three times in going sixteen yards; how often will it revolve in going seventeen hundred and sixty yards?

64. Find a number which exceeds 13427 by as much as 53092 exceeds 52981.

65. A farmer sells a flock of sheep to A, B, and C, selling to B twice as many as to A, and to C twice as many as to B; if C bought 52, how many did the flock contain?

66. Find the remainder when the product of the numbers 3, 4, 5, 6, 7 is divided by their sum.

67. A man dies at the age of 53, and 31 years afterwards his son dies at the age of 48; how old was the father when the son was born?

ARITHMETIC.

PART II.

TABLES.

MONEY.

4 farthings (*f.*) make 1 penny (*d.*).
12 pence „ 1 shilling (*s.*).
20 shillings „ 1 pound (£).

A florin is worth 2 shillings.
A half-crown „ 2 shillings and sixpence.
A crown „ 5 shillings.
A guinea „ 21 shillings.

PENCE TABLE.

d.		*s.*	*d.*	*d.*		*s.*	*d.*	*d.*		*s.*	*d.*
12	make	1	0	60	make	5	0	108	make	9	0
20	„	1	8	70	„	5	10	110	„	9	2
24	„	2	0	72	„	6	0	120	„	10	0
30	„	2	6	80	„	6	8	130	„	10	10
36	„	3	0	84	„	7	0	132	„	11	0
40	„	3	4	90	„	7	6	140	„	11	8
48	„	4	0	96	„	8	0	144	„	12	0
50	„	4	2	100	„	8	4				

MEASURES OF LENGTH.

LINEAR MEASURE.

12 inches (*in.*)	make	1 foot (*ft.*).
3 feet	,,	1 yard (*yd.*).
5½ yards	,,	1 rod, pole, or perch (*p.*).
40 poles or 220 yards	,,	1 furlong (*f.*).
8 furlongs or 1760 yards	,,	1 mile (*m.*).

CLOTH MEASURE.

2¼ inches	make	1 nail (*n.*).
4 nails	,,	1 quarter (*qr.*).
4 quarters	,,	1 yard.

SURVEYOR'S LAND MEASURE.

100 links (*l.*) make 1 chain (*ch.*).
The chain is equal to 22 yards.

Other measures of length used for special purposes are—
Hand, equal to 4 inches, used for the height of horses.
Fathom, equal to 6 feet, used for depths, &c., at sea.

The *Irish mile* contains 2440 yards, and eleven Irish miles are equal to 14 English.

MEASURES OF WEIGHT.

AVOIRDUPOIS.

16 drams (*drs.*)	make	1 ounce (*oz.*).
16 ounces	,,	1 pound (*lb.*).
14 pounds	,,	1 stone (*st.*).
28 pounds	,,	1 quarter (*qr.*).
4 quarters (112 *lbs.*)	,,	1 hundredweight (*cwt.*).
20 hundredweight	,,	1 ton (*t.*).

By this weight are weighed all common goods.

TROY.

24 grains (*grs.*)	make	1 pennyweight (*dwt.*).
20 pennyweights	„	1 ounce (*oz.*).
12 ounces	„	1 pound (*lb.*).

Used for gold, silver, and jewellery, and in experiments in chemistry, &c.

APOTHECARIES'.

20 grains (*grs.*)	make	1 scruple (*sc.*).
3 scruples	„	1 dram (*dr.*).
8 drams	„	1 ounce (*oz.*).
12 ounces	„	1 pound (*lb.*).

Used for preparing medicines.

The grain ounce and pound are of the same weight in Troy and Apothecaries' weight.

1 pound Avoirdupois contains 7000 grains Troy or Apothecaries'.

TIME.

60 seconds (*s.*)	make	1 minute (*m.*).
60 minutes	„	1 hour (*h.*).
24 hours	„	1 day (*d.*).
7 days	„	1 week (*w.*).
4 weeks	„	1 lunar month (*mo.*).

A solar year is the time in which the seasons exactly complete their round; it contains very nearly 365¼ days. To avoid reckoning the quarter of a day the year is taken to be 365 days, and every fourth year, called Leap Year, has 366 days.

The year is divided into twelve *calendar months*—

January	with 31	days.	July	with 31	days.
February	„ 28	„	August	„ 31	„
March	„ 31	„	September	„ 30	„
April	„ 30	„	October	„ 31	„
May	„ 31	„	November	„ 30	„
June	„ 30	„	December	„ 31	„

The extra day of Leap Year is added on to the month of February, making it have 29 days.

The following rhyme enables the days in each month to be remembered :—

"Thirty days have September,
April, June, and November.
All the rest have thirty-one,
Except in Leap Year, at which time
February's days are twenty-nine."

To find whether any year is Leap Year, divide its number A.D. by 4 ; if there be no remainder, it is Leap Year.

SURFACE.

144 square inches (*sq. in.*)	make	1 square foot (*sq. ft.*).
9 square feet	,,	1 square yard (*sq. yd.*).
30¼ square yards	,,	1 sq. rod, pole, or perch (*p.*).
40 poles	,,	1 rood (*r.*).
4 roods or 4840 sq. yards	,,	1 acre (*a.*).
640 acres	,,	1 square mile.

10 square chains or 10,000 square links make 1 acre.

SOLIDITY.

1728 cubic inches (*cu. in.*)	make	1 cubic foot (*cu. ft.*).
27 cubic feet	,,	1 cubic yard (*cu. yd.*).

DRY MEASURE.

4 gills (*g.*)	make	1 pint (*pt.*).
2 pints	,,	1 quart (*qrt.*).
4 quarts	,,	1 gallon (*gal.*).
2 gallons	,,	1 peck (*pk.*).
4 pecks or 8 gals.	,,	1 bushel (*bush.*).
8 bushels	,,	1 quarter (*qr.*).

Used for dry goods, such as corn, &c., which are usually sold by measure and not by weight.

APOTHECARIES' LIQUID MEASURE.

60 minims	make	1 fluid dram.
8 fluid drams	,,	1 fluid ounce.

LIQUID MEASURE.

4 gills (*g.*)	make	1 pint (*pt.*).
2 pints	„	1 quart (*qrt.*).
4 quarts	„	1 gallon (*gal.*).
36 gallons (of beer)	„	1 barrel.
54 gallons	„	1 hogshead (*hhd.*).
63 gallons (of wine)	„	1 hogshead (*hhd.*).
2 hogsheads or 126 gallons	„	1 pipe.

REDUCTION—MONEY.

In expressing concrete quantities of the same kind it is usual to employ several units of various sizes: thus for money we have the units—pound, shilling, penny, and farthing; for length, we have the units—mile, yard, inch, &c.

Reduction is the method of changing the unit or units in terms of which a quantity is expressed.

To reduce a quantity expressed in terms of any unit to a lower one, as pounds to shillings, shillings to pence, &c., multiply by the number of the smaller units contained in the larger one.

Thus, for instance, to express 38 pounds as shillings, we multiply 38 by 20, for since a pound contains 20 shillings, 38 pounds contains 38 times 20 shillings.

£
38
20
760*s.*

So to reduce shillings to pence we must multiply by 12; to reduce pence to farthings, multiply by 4.

To reduce a quantity like £17 6*s.* to shillings, we must multiply 17 by 20 to find the number of shillings in £17, and add in the 6*s.* to get the whole number of shillings.

£	*s.*
17	6
20	
346*s.*	

If the reduction cannot be done at one step, it is done by a succession of steps, each precisely similar to the example given above.

Example.—Bring £23 13*s.* 2½*d.* to farthings. The process would be as in the margin. The £23 is brought to shillings by multiplying by 20, and the 13*s.* added in, giving 473*s.* 2½*d.*; the shillings in like manner are brought to pence, and the 2*d.* added; the pence to farthings, and ½*d.* or 2 farthings added.

£	s.	d.
23	13	2½
20		
473*s.*		
12		
5678*d.*		
4		
22714*f.*		

To express a quantity in terms of a larger unit, as, for example, to reduce pence to shillings, divide by the number of the smaller units contained in the larger one.

Example.—Reduce 736 pence to shillings. We must divide by 12, the number of pence in one shilling; the quotient 61 is the number of clear shillings in 736*d.*, and there are 4*d.* over. If we wished further to express 61*s.* 4*d.* in £ *s.* *d.*, we should bring the 61*s.* to pounds by dividing by 20, giving £3 1*s.*, so that on the whole we have £3 1*s.* 4*d.*

12)736
61*s.* 4*d.*

Similarly any such question can be solved; thus to reduce 903 farthings to shillings and pence. Dividing by 4 we have 225 pence and 3 farthings, and then dividing by 12 to bring the pence to shillings we get 18*s.* 9¾*d.*

4)903
12)225¾*d.*
18*s.* 9¾*d.*

67. Reduce—

1. 584 pounds to shillings.
2. 876 shillings to pence.
3. 7961 pence to farthings.
4. 1376 pounds to pence.
5. 735 shillings to farthings.
6. 631 shillings to halfpence.
7. 173 pounds to pence.

8. 16 pounds to farthings.
9. 793 shillings to farthings.
10. 914 pounds to halfpence.
11. 93 guineas to pence.
12. 653 crowns to pence.
13. 3056 pounds to farthings.
14. 1372 guineas to farthings.
15. 7341 crowns to halfpence.
16. 1132 guineas to halfpence.

68. Reduce—

1. £13 4*s.* to shillings.
2. £103 17*s.* to shillings.
3. 19*s.* 6*d.* to pence.
4. 7*s.* 3*d.* to farthings.
5. 12*s.* 7*d.* to halfpence.
6. £7 14*s.* 3*d.* to pence.
7. £18 10*s.* 11*d.* to pence.
8. £3 19*s.* 7*d.* to farthings.
9. 4*s.* 2¾*d.* to farthings.
10. 18*s.* 9¾*d.* to farthings.
11. £2 3*s.* 2½*d.* to farthings.
12. £37 15*s.* 4½*d.* to farthings
13. £41 13*s.* 5¾*d.* to farthings
14. 19*s.* 7½*d.* to halfpence.
15. £3 9*s.* 10½*d.* to halfpence.
16. £634 10*s.* 10*d.* to pence.
17. £50 3*s.* 0¼*d.* to farthings.
18. £2 0*s.* 11*d.* to halfpence.
19. £713 0*s.* 10*d.* to pence.
20. £21 0*s.* 0¾*d.* to farthings.

69. Reduce to £ *s.* *d.*—

1. 536072 shillings.
2. 5317 pence.
3. 943 farthings.
4. 12448 pence.
5. 176769 pence.
6. 16629 farthings.
7. 770002 farthings.
8. 727170 pence.
9. 534734 farthings.
10. 720370 pence.
11. 30197 halfpence.
12. 38003 farthings.
13. 159047 pence.
14. 5413404 farthings.
15. 303601 halfpence.
16. 1496987 pence.
17. 384654 farthings.
18. 92161 halfpence.
19. 705408 farthings.
20. 1290298 pence.

Many questions in reduction cannot be solved by multiplication or division alone, like the preceding examples; this will happen when the unit in terms of which

the quantity is to be expressed is not an exact multiple or part of that in terms of which it is given.

Example.—Find how many fourpenny-pieces there are in 688 half-crowns. We must first bring the half-crowns to pence by multiplying by 30, and then bring the pence to fourpenny-pieces by dividing by 4.

688 half-crowns.
30
4)20640 pence.
5160 fourpenny-pieces.

Example—Express 835 half-guineas in pounds, shillings, and pence.

We may express the half-guineas in sixpences by multiplying by 21, since a half-guinea or 10*s.* 6*d.* contains 21 sixpences.

Divide by 2 to bring to shillings, the remainder 1 is 1 sixpence or 6*d.* Then divide by 20 to bring the shillings to pounds.

835 half-guineas.
21
835
1670
2)17535 sixpences.
2,0)876,7*s.* and 6*d.*
£438 7*s.* 6*d.*

70. Reduce—

1. 85632 threepenny-pieces to £ *s.* *d.*
2. £528 6*s.* 6*d.* to sixpenny-pieces.
3. 834027 fourpenny-pieces to £ *s.* *d.*
4. £841 18*s.* to florins.
5. 400371 guineas to sixpenny-pieces.
6. 17724 threepenny-pieces to guineas.
7. 43027 crowns to £ *s.*
8. £171 12*s.* 6*d.* to half-crowns.
9. 74837 half-crowns to threepenny-pieces.
10. 53042 half-sovereigns to fourpenny-pieces.
11. 73020 halfpennies to half-crowns.
12. 437 half-guineas to farthings.
13. 3360 crowns to guineas.
14. 81304 guineas to florins.
15. 7385 guineas to crowns.

16. 17932 half-crowns to half-sovereigns.
17. 75630 threepenny-bits to half-crowns.
18. £1374 10*s.* 8*d.* to fourpenny-pieces.
19. 8631 florins to guineas.
20. 94941 sixpenny-pieces to half-guineas.

71.

1. How many sixpenny-pieces are there in forty-nine pounds nine?

2. Reduce six thousand fourpenny-pieces to pounds.

3. Find the value of a million penny postage stamps.

4. How many fourpenny-pieces are there in five thousand two hundred and eighty half-crowns?

5. Reduce five hundred half-crowns to half-sovereigns.

6. How many florins are there in thirty-six thousand and sixty-four half-crowns?

7. Reduce seven hundred and sixteen guineas to fourpenny-pieces.

8. How many half-crowns are there in eighteen pounds seven and sixpence?

9. Reduce seven hundred and four half-guineas to farthings.

10. Reduce nine hundred and fifty-three guineas to pounds and shillings.

11. How many half-crowns are there in seven hundred and ninety sixpences?

12. Reduce fifty-eight half-crowns to farthings.

13. Find (1) how many sixpences, (2) how many half-crowns, and (3) how many fourpenny-pieces there are in seventy-two pounds fifteen?

14. Find (1) how many crowns, (2) how many guineas there are in eight thousand five hundred and five pounds.

15. If a *franc* be worth ten pence, find the value in

English money (1) of three hundred and twenty-four francs, (2) of eighty-three thousand four hundred francs.

16. (1) How many francs are there in twenty-three pounds eleven and eightpence? (2) How many in eight thousand and three pounds three and fourpence?

ADDITION OF MONEY.

In adding sums of money expressed in £ *s.* *d.*, exactly the same principle is followed as in adding simple numbers expressed in units, tens, &c. The sums to be added are written pence under pence, shillings under shillings, &c., and then the columns of pence, shillings, &c., are added separately, just as units, tens, &c., in simple addition.

Example.—Add together £35 7*s.* 6½*d.*, £2 13*s.* 4¼*d.*, 17*s.* 0¾*d.*, and £8 13*s.* 6¼*d.* The farthings added come to 7 farthings, or 1*d.* and 3 farthings; the 3 farthings are put down and the penny added in with the pence column, which comes to 17 pence or 1*s.* 5*d.*; the 5*d.* is put down and the 1*s.* is carried to the next column, making its sum 51 shillings or £2 11*s.*; the 11*s.* is put down and £2 carried and added to the pounds, giving £47; therefore the complete sum is £47 11*s.* 5¾*d.*

£	*s.*	*d.*
35	7	6½
2	13	4¼
0	17	0¾
8	13	6¼
47	11	5¾

72.

d.	*d.*	*d.*	*d.*	*d.*	*d.*
1. ¼	*2.* ¼	*3.* ¾	*4.* ½	*5.* ¾	*6.* ½
½	½	¼	¼	¾	¼
¼	¾	¾	¾	¼	½
¾	¼	¾	½	¼	¼
—	—	—	—	—	—

d.	*d.*	*d.*	*d.*	*d.*	*d.*
7. 3	*8.* 7	*9.* 3	*10.* 2	*11.* 9	*12.* 7
2	8	2	8	11	3
7	3	9	7	10	4
9	4	10	5	6	9
10	9	11	6	7	10
6	10	9	3	8	9
—	—	—	—	—	—

s.	*s.*	*s.*	*s.*	*s.*	*s.*
13. 9	*14.* 3	*15.* 7	*16.* 12	*17.* 10	*18.* 3
3	4	6	17	19	18
7	8	3	13	12	5
8	12	4	9	8	17
6	6	9	6	11	6
5	—	10	3	6	10
—		—	—	—	—

73.

d.	*d.*	*d.*	*d.*	*d.*
1. $3\frac{1}{2}$	*2.* $6\frac{1}{4}$	*3.* $2\frac{1}{4}$	*4.* $1\frac{1}{4}$	*5.* $4\frac{1}{4}$
$2\frac{1}{4}$	$3\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$
$1\frac{3}{4}$	$\frac{1}{4}$	$1\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{2}$
$2\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{3}{4}$	$1\frac{3}{4}$
—	—	—	—	—

d.	*d.*	*d.*	*d.*	*d.*
6. $2\frac{1}{4}$	*7.* $6\frac{3}{4}$	*8.* $10\frac{1}{4}$	*9.* $9\frac{1}{2}$	*10.* $11\frac{1}{2}$
$7\frac{1}{2}$	$8\frac{1}{2}$	$5\frac{1}{2}$	11	$3\frac{3}{4}$
$3\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{4}$	$6\frac{1}{4}$	$\frac{1}{2}$
$8\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	8	$8\frac{1}{4}$
$2\frac{1}{2}$	$7\frac{1}{4}$	$10\frac{1}{4}$	$10\frac{1}{2}$	10
—	—	—	—	—

74. Add together—

1. $7\frac{1}{2}d.$, $8\frac{1}{4}d.$, $9d.$, $11\frac{3}{4}d.$
2. $6\frac{3}{4}d.$, $2\frac{1}{2}d.$, $8\frac{1}{4}d.$, $3\frac{1}{2}d.$, $10d.$
3. $8\frac{1}{4}d.$, $2d.$, $11d.$, $9\frac{1}{2}d.$, $6d.$
4. $7\frac{1}{4}d.$, $3\frac{3}{4}d.$, $8\frac{1}{2}d.$, $10\frac{1}{4}d.$, $9d.$
5. $6\frac{1}{2}d.$, $7d.$, $8d.$, $10\frac{3}{4}d.$, $\frac{1}{2}d.$, $\frac{1}{4}d.$
6. $8\frac{1}{4}d.$, $2d.$, $1\frac{1}{2}d.$, $\frac{3}{4}d.$, $11\frac{1}{2}d.$, $4d.$
7. $2\frac{1}{2}d.$, $3\frac{1}{4}d.$, $9d.$, $7d.$, $4\frac{1}{2}d.$, $6\frac{3}{4}d.$
8. $7\frac{3}{4}d.$, $11\frac{1}{4}d.$, $8d.$, $6d.$, $2\frac{1}{4}d.$, $6d.$
9. $11d.$, $\frac{1}{2}d.$, $\frac{3}{4}d.$, $6\frac{1}{2}d.$, $8d.$, $4\frac{1}{4}d.$
10. $5d.$, $3\frac{1}{4}d.$, $10\frac{1}{2}d.$, $\frac{3}{4}d.$, $11d.$, $9\frac{1}{2}d.$

75.

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
1.	2	3	*2.*	5	6	*3.*	8	4	*4.*	7	10	*5.*	1	11
	7	2		1	7		6	6		1	3		2	3
	4	1		2	9		3	10		2	7		8	2
	5	9		3	8		1	9		4	8		6	4

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
6.	9	6	*7.*	7	2	*8.*	7	1	*9.*	4	1	*10.*	17	2
	10	7		3	11		8	7		5	2		19	0
	11	3		5	0		16	3		6	3		3	4
	8	4		10	3		17	9		8	10		2	6
	6	5		13	4		10	0		11	9		1	2
				6	8		6	11		6	3		7	6

76. Add together—

1. $1s.\ 2d.$; $7s.\ 5d.$; $4s.\ 8d.$; $9s.\ 7d.$; $8s.\ 8d.$; $9s.\ 1d.$
2. $9s.\ 3d.$; $2s.\ 6d.$; $8s.\ 11d.$; $7s.\ 6d.$; $4s.\ 8d.$; $5s.\ 11d.$
3. $4s.\ 10d.$; $8s.\ 9d.$; $7s.\ 10d.$; $6s.$; $3s.\ 7d.$; $2s.\ 11d.$; $10s.$
4. $5s.\ 3d.$; $7s.$; $11s.\ 4d.$; $12s.\ 6d.$; $13s.\ 2d.$; $4s.\ 7d.$

5. 17*s.* 1*d.*; 3*s.* 3*d.*; 5*s.* 7*d.*; 12*s.* 3*d.*; 16*s.* 6*d.*; 14*s.*
6. 12*s.* 3*d.*; 10*s.* 11*d.*; 8*s.* 9*d.*; 7*s.* 4*d.*; 5*s.* 1*d.*; 15*s.*; 8*s.*
7. 16*s.* 2*d.*; 12*s.* 3*d.*; 19*s.* 10*d.*; 10*s.* 6*d.*; 6*s.* 10*d.*; 9*s.* 4*d.*
8. 13*s.* 1*d.*; 4*s.* 7*d.*; 8*s.* 3*d.*; 17*s.*; 12*s.* 9*d.*; 8*d.*; 10*d.*
9. 7*s.* 3*d.*; 11*d.*; 6*s.* 11*d.*; 17*s.* 3*d.*; 8*d.*; 4*s.* 9*d.*; 5*d.*
10. 14*s.* 2*d.*; 15*s.*; 9*d.*; 19*s.* 10*d.*; 10*s.* 2*d.*; 12*s.* 8*d.*; 7*d.*

77.

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
1.	5	7½	*2.*	3	10½	*3.*	9	6½	*4.*	8	2½	*5.*	7	3½
	6	2¼		4	5¼		10	7¾		3	7¼		8	2¼
	7	6¾		6	7¼		11	8¼		5	6¾		9	1¾
	1	2¼		8	10¾		6	7¾		10	7¾		10	2½

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
6.	17	3½	*7.*	19	2¼	*8.*	10	3¼	*9.*	4	3½	*10.*	17	2
	12	0¼		8	1½		3	2¼		5	0¼		12	3¾
	13	1¾		3	8¾		5	6½		7	3½		10	2½
	1	7		2	7		12	11¼		6	11		6	1¼
	3	6½		4	0¾		7	6		8	6		5	4

78. Add together—

1. Six and elevenpence; five and fourpence farthing; ten and sixpence; one and a penny halfpenny.

2. Eleven and twopence; six and threepence; two and twopence three-farthings; nine and ninepence.

3. Seventeen and sixpence; three and fivepence; four and fourpence halfpenny; eleven and tenpence three-farthings; eightpence.

4. Five and sevenpence halfpenny; ten shillings; six and threepence three-farthings; tenpence; seven and twopence; ninepence farthing.

5. Thirteen and tenpence halfpenny; five and fourpence farthing; elevenpence halfpenny; twelve shillings and a halfpenny.

6. Fifteen and twopence three-farthings; ten and fivepence; nine and sevenpence three-farthings; sixpence halfpenny; nineteen shillings.

7. Four and fourpence; eleven and eightpence halfpenny; sevenpence farthing; eighteen and threepence three-farthings; twelve and a penny.

8. Fourteen and elevenpence halfpenny; ten and fivepence; six and a halfpenny; one and fivepence farthing; eight and eightpence three-farthings; ten and sixpence.

9. Six and fourpence halfpenny; seven and tenpence farthing; nine and ninepence; two and sixpence three-farthings.

10. Sixteen and elevenpence; thirteen and twopence halfpenny; five and sevenpence farthing; elevenpence three-farthings; ten and a farthing; nineteen and eightpence halfpenny.

79.

	£	s.	d.
1.	5	3	2
	7	4	6
	8	7	5
	2	1	4

	£	s.	d.
2.	2	7	6
	3	1	4
	5	8	10
	8	7	2

	£	s.	d.
3.	7	3	7
	8	4	8
	5	0	7
	3	9	0

	£	s.	d.
4.	4	7	6
	5	10	2
	6	9	8
	9	7	10

	£	s.	d.
5.	6	7	2
	2	13	6
	3	11	8
	5	3	8
	10	1	2

	£	s.	d.
6.	16	7	4
	13	11	1
	21	13	3
	4	7	11
	6	3	2

	£	s.	d.
7.	2	12	6
	5	17	2
	8	3	10
	7	1	9
	17	4	3

	£	s.	d.
8.	8	7	6
	3	2	4
	1	12	2
	7	0	10
	12	10	5

	£	s.	d.
9.	2	13	4
	5	3	6
	8	7	10
	13	12	11
	15	17	2

	£	s.	d.
10.	1	7	3
	5	18	9
	6	0	10
	15	3	8
	24	15	0

	£	s.	d.
11.	11	11	11
	3	13	4
	8	17	2
	6	0	8
	2	7	3

	£	s.	d.
12.	17	3	8
	21	2	4
	9	17	6
	3	15	4
	5	7	10

80.

1.			2.			3.			4.		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
7	3	6½	11	3	9½	8	13	2¼	5	7	6½
3	7	4¼	12	17	6¼	21	5	10¾	3	14	2¼
5	8	6¾	3	19	10½	6	3	4½	12	17	1¼
2	7	2¼	2	6	2¼	4	12	7¾	5	19	3¾

5.			6.			7.			8.		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
21	3	2¼	15	16	3½	15	7	4	21	3	8¼
7	5	1	21	14	5¼	12	13	5¼	12	7	4
14	10	7¾	3	7	2	3	8	6½	13	19	6¾
16	4	6½	5	0	11¼	7	2	4¼	25	3	2
7	9	2	12	11	10½	10	0	0½	71	8	6¼

9.			10.			11.			12.		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
13	4	4½	21	3	2	30	3	2¾	16	3	9
23	8	10¾	17	8	4¼	15	7	6½	12	14	2½
17	15	6½	23	14	6½	8	13	1¼	8	9	10¼
3	8	7¾	8	0	0¾	12	19	3¾	27	13	3
5	0	3½	7	3	6½	23	3	8¼	52	9	9½
13	7	11¾	10	15	2	34	8	7¾	36	10	3¾

81. Add together—

1. £21 3*s.* 5*d.*; £19 7*s.* 6½*d.*; £32 8*s.* 11¼*d.*; £21 2*s.* 10*d.*; £5 16*s.* 3½*d.*; £2 9*s.* 2¼*d.*

2. £7 18*s.* 4¾*d.*; £35 7*s.* 8½*d.*; £53 12*s.* 10¾*d.*; £5 6*s.* 3½*d.*; £20 17*s.* 2*d.*; £31 7*s.* 5½*d.*

3. £13 12*s.* 6¾*d.*; £12 3*s.* 6½*d.*; £9 9*s.* 8¾*d.*; £83 14*s.* 10*d.*; £71 9*s.* 3¾*d.*; £1 12*s.* 6¾*d.*

4. £3 14*s.* 5½*d.*; £53 12*s.* 4¾*d.*; £85 17*s.* 3¾*d.*; £50 12*s.* 1½*d.*; £83 5*s.* 6¾*d.*; £37 15*s.* 6¼*d.*

5. £42 7*s.* 9*d.*; £58 19*s.* 3¼*d.*; £71 12*s.* 3¾*d.*; £20 0*s.* 9*d.*; £63 18*s.* 7¾*d.*; £72 10*s.* 5½*d.*; £28 13*s.* 8*d.*

6. £83 7*s.* 5*d.*; £92 8*s.* 4¼*d.*; £6 7*s.* 7½*d.*; £23 13*s.* 4½*d.*; £39 7*s.* 8½*d.*; £3 0*s.* 0½*d.*

7. £5 8*s.* 6¾*d.*; £51 9*s.* 8¼*d.*; £33 7*s.* 3½*d.*; £74 9*s.* 6¾*d.*; £8 8*s.* 8½*d.*; £10 19*s.* 10¾*d.*; £13 12*s.* 7*d.*

8. £6 15*s.* 11½*d.*; £17 9*s.* 8½*d.*; £42 17*s.* 1½*d.*; £91 3*s.* 7½*d.*; £15 14*s.* 9½*d.*; £25 15*s.* 8¾*d.*; £65 1*s.* 9½*d.*

9. £76 14*s.* 8¾*d.*; £85 11*s.* 3½*d.*; £73 4*s.* 2½*d.*; £12 13*s.* 10¾*d.*; £11 9*s.* 3½*d.*; £93 17*s.* 3½*d.*; £41 7*s.* 8½*d.*

10. £87 13*s.* 4½*d.*; £22 13*s.* 8¾*d.*; £18 17*s.* 10½*d.*; £62 19*s.* 8½*d*; £47 15*s.* 9¾*d.*; £11 9*s.* 10¾*d.*; £8 4*s.* 5¾*d.*

82.

1.			*2.*			*3.*			*4.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
432	5	9	7	14	3¼	20	3	6	16	14	2
761	16	2½	32	5	8½		18	10		19	11½
137	12	8¾	652	10	7¼	4	12	8¼	4	3	6¾
83	4	11½		17	8¾	81	17	3½	631	12	1
62	0	8	5	4	2		2	7¾	72	0	0¼

5.			6.			7.			8.		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
73	10	7	6	8	$7\frac{3}{4}$	25	3	$7\frac{1}{4}$	71	8	6
5	0	$3\frac{1}{4}$	22	17	$6\frac{1}{2}$	100	10	10		19	$7\frac{1}{2}$
642	17	2		9	$11\frac{1}{4}$		7	$6\frac{1}{2}$			$10\frac{1}{4}$
87	12	$5\frac{1}{2}$	4	3	$0\frac{1}{2}$	57	13	$5\frac{1}{4}$	4	3	$6\frac{3}{4}$
	15	$2\frac{1}{4}$	735	6	$8\frac{3}{4}$	8	9	3	18	7	$2\frac{1}{2}$
1	7	$10\frac{1}{2}$		18	$6\frac{1}{2}$	4	0	$0\frac{3}{4}$		8	$3\frac{3}{4}$

9.			10.			11.			12.		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
2	8	6	24	3	9	6	7	1	52	9	3
23	4	$8\frac{1}{2}$	81	17	$2\frac{1}{4}$	92	14	$2\frac{1}{2}$	14	7	$4\frac{1}{2}$
	8	$10\frac{3}{4}$	13	0	$0\frac{1}{4}$		5	7	75	13	$7\frac{3}{4}$
685	12	3		9	3	730	4	$5\frac{3}{4}$		18	8
		$9\frac{1}{2}$	2	1	$8\frac{3}{4}$		19	7			$3\frac{1}{4}$
8	4	$6\frac{3}{4}$			$11\frac{1}{2}$	57	4	$9\frac{1}{2}$	420	7	8
35	13	$11\frac{1}{2}$	431	9	8	20	13	2	65	3	$5\frac{1}{4}$

83. Add together—

1. Forty-five pounds eight shillings and sixpence; seven shillings and ninepence; six hundred pounds fifteen shillings; twenty-five pounds and fivepence.

2. Sixteen shillings and a halfpenny; two pounds eight shillings and twopence; eighty pounds and tenpence farthing; nineteen shillings; sixpence three-farthings.

3. Five hundred and forty-one pounds ten shillings; ninety-five pounds two shillings and sixpence; eight shillings and fourpence halfpenny; elevenpence farthing.

4. One thousand and three pounds fifteen shillings; nine shillings and tenpence; seventy-four pounds and twopence farthing; fifty-one pounds seven shillings.

5. Seventeen pounds fourteen shillings and ninepence farthing; eight pounds and eightpence; three pounds and three farthings; nineteen shillings and sixpence.

6. Five hundred and fifty pounds three shillings and fourpence; nine pounds ten shillings and sevenpence farthing; twelve shillings and eightpence; one hundred and twelve pounds seventeen shillings; four pounds and fourpence three-farthings.

7. Twenty-seven pounds three shillings and sixpence; four hundred pounds and fivepence halfpenny; eightpence; nine shillings and a farthing; fifty-one pounds seven shillings and tenpence.

8. Two pounds and twopence; two shillings and three-farthings; twenty-six pounds seventeen shillings and fourpence; sevenpence three-farthings; eight pounds six shillings and elevenpence; twelve shillings.

9. Twenty-eight pounds and tenpence; ten shillings and eightpence farthing; seventy pounds fourteen shillings; sixty-four pounds and twopence; nine hundred and fifty-three pounds fourteen shillings and eightpence three-farthings; sixpence farthing.

10. Four pounds six shillings and a halfpenny; nineteen pounds eight shillings and tenpence farthing; sixteen shillings and threepence halfpenny; twelve pounds and a penny halfpenny; sixty-seven pounds nineteen shillings and threepence; twenty pounds five shillings and twopence farthing.

84.

1. A dairyman at market sold his butter for seventeen and sixpence, his eggs for ten and fourpence halfpenny, and eight fowls for one pound three and fourpence; how much did he receive altogether?

2. I paid at a grocer's one and elevenpence halfpenny for sugar, eight and threepence for tea, twopence halfpenny for pepper, one penny for salt, and six and ninepence for cheese; how much did I spend altogether?

3. An old woman possesses three sovereigns and a half-sovereign hidden in a stocking, fifteen and twopence in a drawer, six pounds seven and threepence in a savings' bank, and one and a penny in her pocket; of how much does her wealth consist?

4. If my coat costs one pound seven and sixpence, my waistcoat twelve and threepence, and my trousers eighteen and fourpence, how much does my whole suit cost?

5. A man spends for tobacco sevenpence halfpenny, for a pair of boots eight shillings, and for a hat three and fourpence; he loses a sixpence through a hole in his pocket, and has thirteen and elevenpence halfpenny left; how much had he to start with?

6. The father of a family earns twenty-two shillings a week, his wife earns five and threepence by washing, and his two eldest boys earn two and threepence each; what is the whole income of the family in a week?

7. A farmer receives in one year for cattle one hundred and forty-one pounds; for butter, milk, and poultry fifty-nine pounds eleven and sevenpence; for his crop of corn two hundred and eighty-six pounds ten shillings; for hay ninety-one pounds; and for turnips eighty-nine pounds nineteen and ninepence: how much was his farm produce for the year worth?

8. To six poor people a gentleman gave the following sums—to the first two and threepence halfpenny, to the second one and fivepence, to the third six and sixpence, to the fourth four and a penny halfpenny, and to each of the other two five and threepence; how much did he give away altogether?

9. How much do three cottages cost me if I give for the first three hundred pounds ten shillings, for the second two hundred and thirty-one pounds eight and sixpence, for the third two hundred and seventeen pounds five shillings, and if I pay for repairs seventy-two pounds six and fourpence?

SUBTRACTION OF MONEY.

Compound subtraction differs in no respect in principle from simple subtraction; the work is performed piecemeal, the pence being subtracted from the pence, the shillings from the shillings, &c., just as in simple subtraction, the units from the units, the tens from the tens, &c.

Example.—Subtract £14 17*s.* 6½*d.* from £18 9*s.* 4¾*d.*

Beginning with the farthings we take ½*d.* from ¾*d.* and ¼*d.* remains. We cannot take 6*d.* from 4*d.*, but we shall not alter the final result if we add 1*s.* or 12*d.* to both quantities; let us then add 12*d.* to the pence of the top line, making 16*d.*, and 1*s.* to the shillings of the bottom, making 18*s.*; now we can take 6*d.* from 16*d.* and 10*d.* remains. We cannot take 18*s.* from 9*s.*, so we add as before 20*s.* to the top line, giving 29*s.*, and £1 to the bottom, giving £15; we can then take 18*s.* from 29*s.* leaving 11*s.*, and £15 from £18 leaving £3.

£	*s.*	*d.*
18	9	4¾
14	17	6½
3	11	10¼

85.

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
1.	17	5¾	*2.*	18	9½	*3.*	12	6¾	*4.*	16	11¼	*5.*	19	10½
	12	2½		3	5¼		10	4½		4	8		5	0¼

	6.			*7.*			*8.*			*9.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
37	14	6	21	15	8	13	7	4½	56	17	11¾
15	2	3	14	7	5	5	7	1¼	29	13	6¾

	10.			*11.*			*12.*			*13.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
85	13	10½	16	15	9¾	132	9	8½	236	7	10½
12	7	10¼	13	7	0½	53	7	2¼	85	3	10½

86.

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
1.	4	$7\frac{1}{4}$	*2.*	18	$9\frac{1}{4}$	*3.*	7	$8\frac{1}{2}$	*4.*	12	$6\frac{1}{2}$	*5.*	16	$8\frac{1}{4}$
	1	$2\frac{1}{2}$		6	$7\frac{3}{4}$		3	$5\frac{3}{4}$		3	$5\frac{3}{4}$		5	$7\frac{3}{4}$

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
6.	16	8	*7.*	19	$2\frac{1}{2}$	*8.*	12	$6\frac{1}{2}$	*9.*	14	$1\frac{3}{4}$	*10.*	17	$6\frac{1}{2}$
	12	11		12	$8\frac{1}{4}$		3	$7\frac{1}{4}$		3	$2\frac{1}{4}$		13	$9\frac{1}{2}$

11.			*12.*			*13.*			*14.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
5	8	6	16	17	2	20	7	$3\frac{1}{2}$	23	19	$2\frac{3}{4}$
3	4	10	5	13	7	13	2	$1\frac{3}{4}$	5	18	$4\frac{1}{2}$

87.

1. From eleven shillings and sevenpence halfpenny subtract five shillings and sixpence three-farthings.

2. From nineteeen shillings and threepence farthing subtract twelve shillings and eightpence farthing.

3. From five pounds fourteen shillings and tenpence subtract two pounds seventeen shillings and sevenpence.

4. From eighteen pounds three shillings and fourpence halfpenny subtract ten pounds seven shillings and two-pence-farthing.

5. From fifty pounds ten shillings and sevenpence take forty-nine pounds eleven shillings and threepence.

6. From one hundred and thirteen pounds twelve shillings and twopence take ninety-eight pounds five shillings and tenpence.

7. From one thousand and three pounds six shillings and eightpence take eight hundred and thirty-five pounds ten shillings and fourpence.

8. Subtract ninety-eight pounds seventeen shillings and threepence farthing from one hundred pounds one shilling and tenpence halfpenny.

9. Subtract seventy-four pounds six shillings and a halfpenny from one hundred and sixty-three pounds twelve shillings and sixpence farthing.

10. Subtract four hundred and eighty-nine pounds two shillings and elevenpence halfpenny from one thousand pounds seventeen shillings and twopence halfpenny.

88.

	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
1.	17	$3\frac{1}{4}$	*2.*	12	$10\frac{1}{2}$	*3.*	19	$3\frac{1}{4}$	*4.*	16	$9\frac{1}{4}$	*5.*	14	$2\frac{1}{2}$
	13	$8\frac{1}{2}$		10	$11\frac{3}{4}$		5	$11\frac{3}{4}$		5	$10\frac{3}{4}$		10	$8\frac{3}{4}$

	6.			*7.*			*8.*			*9.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
3	7	$2\frac{1}{2}$	22	14	$1\frac{1}{4}$	56	4	$7\frac{1}{2}$	213	9	$8\frac{1}{4}$
1	2	$9\frac{3}{4}$	17	5	$8\frac{1}{2}$	35	2	$10\frac{3}{4}$	56	7	$9\frac{1}{2}$

	10.			*11.*			*12.*			*13.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
27	4	8	52	6	2	39	2	4	76	9	6
13	6	9	13	11	9	21	15	10	43	10	9

	14.			*15.*			*16.*			*17.*		
£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*	£	*s.*	*d.*
635	7	$2\frac{1}{2}$	832	17	$1\frac{1}{4}$	129	7	$8\frac{1}{2}$	876	4	$9\frac{3}{4}$
274	16	$9\frac{1}{4}$	194	19	$4\frac{1}{4}$	43	19	$9\frac{1}{4}$	598	6	$10\frac{1}{2}$

89.

	£	s.	d.		£	s.	d.
1.	3176	14	2	−	1395	17	6
2.	563	15	5¼	−	489	19	4½
3.	135	4	6¾	−	58	13	10½
4.	773	12	3¼	−	689	17	8½
5.	836	14	2½	−	97	15	1¾
6.	1754	1	6¾	−	836	10	10½
7.	6259	7	4	−	799	17	5
8.	834	1	1	−	798	19	11
9.	437	8	6¼	−	48	18	7½
10.	6305	7	10½	−	5836	10	0¾
11.	1781	15	6¼	−	392	17	0½
12.	6384	12	2½	−	793	15	8½

90.

1.			*2.*			*3.*			*4.*		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
3	17	0½	16	5	4	137	0	3¼	63	9	0
2	5	8¾	8	7	2¼	82	7	2½	17	6	2½

5.			*6.*			*7.*			*8.*		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
12	17	10	75	13	0¼	736	0	2¼	672	4	0
3	19	11½	12	15	9½	82	10	5¾	395	17	8½

9.			*10.*			*11.*			*12.*		
£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
30	0	2	789	0	10	65	12	0	1437	0	0
22	6	3¼	135	17	11½	29	15	6¾	936	8	4

91.

	£	s.	d.		£	s.	d.
1.	7384	15	$0\frac{1}{4}$	–	1596	15	8
2.	843	0	6	–	9	9	$9\frac{1}{2}$
3.	1836	0	7	–	12	2	$8\frac{1}{2}$
4.	6374	11	$0\frac{1}{2}$	–	55	12	$3\frac{1}{2}$
5.	832	5	0	–	72	19	$8\frac{1}{2}$
6.	432	8	0	–	33	12	$3\frac{1}{4}$
7.	2	14	2	–		19	$8\frac{1}{2}$
8.	1	6	$9\frac{3}{4}$	–		12	$6\frac{3}{4}$
9.	2	1	$0\frac{1}{2}$	–		3	$8\frac{1}{2}$
10.	758	10	0	–	693	4	$2\frac{1}{4}$
11.	503	0	0	–	43	5	$8\frac{1}{2}$
12.	6239	0	0	–	583	4	$11\frac{1}{2}$

92.

1. From one pound seven shillings take thirteen shillings and eightpence.

2. From seven hundred pounds take five hundred and forty pounds nineteen shillings and twopence halfpenny.

3. Subtract nineteen shillings and elevenpence three-farthings from two pounds seventeen shillings.

4. Find the difference between fourteen pounds three shillings and three pounds fourteen shillings.

5. Find the difference between twenty pounds and sixpence halfpenny and twelve pounds eight shillings and twopence.

6. By how much does one hundred pounds exceed eighty-five pounds and a farthing?

7. Find the difference between three pounds nineteen shillings and three-farthings and two pounds nineteen shillings and a penny.

8. By how much is six pounds three shillings and a halfpenny less than seven pounds?

9. Subtract one thousand three hundred and thirty-eight pounds twelve shillings and a penny from ten thousand pounds and twopence.

10. What is the difference between sixty-eight pounds and three-farthings and two hundred and four pounds?

93.

1. Out of three pounds seven shillings and fourpence a man paid one pound twelve and threepence halfpenny; how much had he left?

2. A woman went to market with five pounds in her pocket; when she returned she had two pounds three shillings and a halfpenny; how much had she spent?

3. If out of an income of three hundred and ninety-eight pounds I spend two hundred and thirty-four pounds twelve and twopence, how much do I save in the year?

4. To restore a church six thousand pounds is required; if four thousand and twenty pounds ten and sixpence has been subscribed, how much more is wanted?

5. What sum added to fifty pounds three and sixpence farthing will make eighty-nine pounds one and fourpence halfpenny?

6. If I lend a person five hundred pounds and he pays me back two hundred and forty-five pounds twelve and sixpence, how much does he still owe me?

7. A man paid for a coat with a five pound note and received three pounds fifteen and twopence-halfpenny in change; what was the price of the coat?

8. What change shall I receive if I give two sovereigns in payment of a bill for one pound two and sevenpence three-farthings?

9. A merchant possesses fourteen thousand and five

pounds thirteen and sevenpence; if he loses five thousand and forty-three pounds eighteen and tenpence by a bad debt, how much has he left?

10. If I buy a horse for thirty-four pounds eight and sixpence, and sell him for forty-three pounds six and fourpence, what profit do I make?

94.

1. Out of a ten pound note the following bills are paid—three pounds two and fourpence halfpenny for meat, one pound three and sixpence farthing for groceries, and two pounds fifteen shillings for coal; how much is left out of the note?

2. Four horses cost one hundred and ten pounds; the first cost thirty-one pounds ten shillings, the second forty-three pounds fifteen shillings, the third twenty-nine pounds eight shillings: what was the price of the fourth?

3. If I put into a savings' bank during a year the following amounts: twenty-five pounds three shillings and sixpence; three pounds four shillings and eightpence; seventeen pounds ten shillings; one pound five shillings; and if I then take out twenty-seven pounds three and fourpence, how much remains?

4. A man earns three and sixpence on Monday, four and fivepence halfpenny on Tuesday, five and threepence on Wednesday, three and a penny halfpenny on Thursday, six and tenpence on Friday, and the same on Saturday; if he spends twenty-five shillings and threepence three-farthings, how much does he save during the week?

5. How much money must be added to the sum of three hundred and forty-five pounds twelve and sixpence and one hundred and thirteen pounds five and fourpence to make a thousand pounds?

6. A has in his pocket one pound three and tenpence halfpenny, and B has seventeen and sixpence farthing;

if A gives to B five and threepence halfpenny, how much will each have?

7. The owner of an estate receives fifteen hundred pounds in rents, out of which he pays in taxes one hundred and forty-three pounds two and sevenpence, for repairs eighty-nine pounds twelve and fourpence-halfpenny, and other sundry charges fifty-three pounds eight and elevenpence halfpenny; what is his net income?

8. A man buys a piece of land for fourteen hundred pounds, divides it into three lots, and sells the first for five hundred and one pounds seven and sixpence, the second for six hundred and fourteen pounds, the third for four hundred and fifty-seven pounds ten; what profit does he make?

9. A merchant gains by one speculation two hundred and thirty pounds eleven and fivepence, and by another one hundred and nine pounds fifteen and twopence, by a third he loses three hundred and fifty-four pounds one and elevenpence; has he gained or lost on the whole, and how much?

MULTIPLICATION OF MONEY.

When the multiplier is not greater than 12 and is therefore contained in the multiplication table, proceed as in the following example—

Multiply £6 17*s.* 5¼*d.* by 6. Beginning with the farthings 6 times ¼*d.* is 1½*d.*, the ½*d.* is put down and the 1*d.* carried on; 6 times 5*d.* is 30*d.*, which with the 1*d.* carried is 31*d.* or 2*s.* 7*d.*, of which the 7*d.* is put down and the 2*s.* carried; 6 times 17*s.* are 102*s.*, and with the 2*s.* brought forward this gives 104*s.* or £5 4*s.*; 6 times £6 is £36, which with the £5 gives £41.

£	*s.*	*d.*
6	17	5¼
		6
41	4	7½

95.

	d.	
1.	$3\frac{1}{2}$	$\times 3.$
2.	$4\frac{3}{4}$	$\times 2.$
3.	$1\frac{1}{4}$	$\times 7.$
4.	$2\frac{1}{4}$	$\times 5.$
5.	$3\frac{3}{4}$	$\times 3.$
6.	$1\frac{1}{4}$	$\times 8.$
7.	$2\frac{1}{4}$	$\times 5.$
8.	$1\frac{3}{4}$	$\times 6.$
9.	$5\frac{1}{4}$	$\times 2.$
10.	$1\frac{1}{4}$	$\times 9.$

96.

	d.	
1.	$6\frac{3}{4}$	$\times 7.$
2.	$8\frac{1}{2}$	$\times 9.$
3.	$7\frac{1}{4}$	$\times 3.$
4.	$11\frac{1}{2}$	$\times 4.$
5.	$10\frac{3}{4}$	$\times 2.$
6.	$6\frac{1}{4}$	$\times 8.$
7.	$7\frac{3}{4}$	$\times 10.$
8.	$8\frac{1}{2}$	$\times 5.$
9.	$3\frac{3}{4}$	$\times 11.$
10.	$5\frac{1}{2}$	$\times 7.$

97.

	s.	d.	
1.	3	4	$\times 5.$
2.	2	3	$\times 6.$
3.	7	9	$\times 2.$
4.	1	7	$\times 9.$
5.	4	11	$\times 4.$
6.	5	10	$\times 3.$
7.	1	3	$\times 11.$
8.	2	2	$\times 7.$
9.	2	4	$\times 8.$
10.	1	11	$\times 12.$

98.

	s.	d.	
1.	7	2	$\times 5.$
2.	8	4	$\times 7.$
3.	3	9	$\times 10.$
4.	4	10	$\times 9.$
5.	6	11	$\times 11.$
6.	10	2	$\times 3.$
7.	12	5	$\times 4.$
8.	13	8	$\times 6.$
9.	17	9	$\times 8.$
10.	15	7	$\times 12.$

99.

	s.	d.	
1.	3	$4\frac{1}{2}$	$\times 5.$
2.	2	$9\frac{1}{4}$	$\times 8.$
3.	7	$2\frac{3}{4}$	$\times 12.$
4.	10	$9\frac{1}{2}$	$\times 3.$
5.	9	$2\frac{1}{4}$	$\times 4.$
6.	8	$7\frac{1}{2}$	$\times 7.$
7.	6	$5\frac{3}{4}$	$\times 6.$
8.	2	$11\frac{1}{2}$	$\times 10.$
9.	12	$3\frac{3}{4}$	$\times 9.$
10.	13	$10\frac{1}{2}$	$\times 11.$

100.

	£	s.	d.	
1.	5	3	8	$\times 2.$
2.	7	6	5	$\times 4.$
3.	12	7	2	$\times 6.$
4.	15	9	3	$\times 8.$
5.	3	12	7	$\times 7.$
6.	1	10	4	$\times 5.$
7.	8	13	6	$\times 9.$
8.	10	14	7	$\times 3.$
9.	2	17	10	$\times 10.$
10.	3	15	9	$\times 12.$

101.

	£	s.	d.	
1.	2	3	$5\frac{1}{2}$	$\times 3.$
2.	5	6	$10\frac{1}{4}$	$\times 5.$
3.	8	10	$2\frac{3}{4}$	$\times 6.$
4.	7	12	$4\frac{1}{2}$	$\times 8.$
5.	3	5	$9\frac{3}{4}$	$\times 9.$
6.	4	10	$10\frac{1}{2}$	$\times 11.$
7.	7	13	$2\frac{1}{4}$	$\times 10.$
8.	1	14	$1\frac{3}{4}$	$\times 12.$
9.	6	13	$7\frac{1}{2}$	$\times 7.$
10.	8	19	$8\frac{1}{4}$	$\times 12.$

102.

	£	s.	d.		£	s.	d.
1.	73	6	$8\frac{1}{2} \times 6$.	*6.*	25	0	$11\frac{3}{4} \times 10$.
2.	31	0	$3\frac{1}{4} \times 7$.	*7.*	58	13	$0\frac{1}{4} \times 12$.
3.	22	10	$5\frac{1}{2} \times 3$.	*8.*	69	15	$7\frac{1}{2} \times 11$.
4.	48	12	$0\frac{3}{4} \times 8$.	*9.*	82	9	$3\frac{3}{4} \times 5$.
5.	57	13	$0\frac{1}{2} \times 9$.	*10.*	94	19	$11\frac{1}{4} \times 4$.

103.

	£	s.	d.
1.	432	7	$9\frac{1}{2} \times 3$.
2.	865	13	$2\frac{1}{4} \times 2$.
3.	789	0	$10\frac{3}{4} \times 5$.
4.	120	15	$3\frac{1}{4} \times 7$.
5.	469	17	$1\frac{3}{4} \times 10$.
6.	218	14	$2\frac{1}{2} \times 8$.
7.	384	19	$11\frac{1}{4} \times 11$.
8.	730	18	$2\frac{3}{4} \times 6$.
9.	912	15	$3\frac{1}{2} \times 12$.
10.	604	0	$9\frac{3}{4} \times 12$.

104.

	£	s.	d.
1.	7364	13	$2\frac{1}{2} \times 7$.
2.	1326	12	6×8.
3.	9872	19	$11\frac{1}{4} \times 11$.
4.	3075	18	$10\frac{1}{2} \times 12$.
5.	7326	15	$0\frac{3}{4} \times 11$.
6.	9013	0	$11\frac{1}{4} \times 9$.
7.	7803	14	$8\frac{3}{4} \times 12$.
8.	3924	17	9×6.
9.	8365	11	$10\frac{1}{2} \times 9$.
10.	7906	0	$8\frac{3}{4} \times 12$.

105.—Find the cost of—

1. 7 yards of cloth at 5*s.* $4\frac{1}{2}$*d.* per yard.
2. 6 pounds of tea at 2*s.* $6\frac{1}{4}$*d.* per pound.
3. 9 pairs of shoes at 7*s.* 3*d.* per pair.
4. 12 umbrellas at 8*s.* $10\frac{3}{4}$*d.* each.
5. 5 dozen eggs at 1*s.* $3\frac{1}{2}$*d.* per dozen.
6. 8 horses at £30 2*s.* 6*d.* each.
7. 10 sacks of flour at £3 1*s.* $5\frac{1}{2}$*d.* per sack.
8. 4 acres of land at £120 10*s.* 6*d.* per acre.
9. 11 tons of coal at £1 7*s.* $3\frac{1}{2}$*d.* per ton.
10. One dozen fowls at 3*s.* $4\frac{3}{4}$*d.* each.
11. 9 cows at £12 13*s.* 10*d.* each.

When the multiplier is the product of two factors given in the multiplication table, we may, as explained under simple multiplication, multiply first by one of the factors and then multiply this result by the other factor to obtain the final product.

Example.—Multiply £3 7*s.* 8¼*d.* by 48.
Since 48 is 6 times 8, we multiply first by 8 and then by 6; we thus obtain 6 times 8 times, or 48 times £3 7*s.* 8¼*d.*

£	*s.*	*d.*
3	7	8¼
		8
27	1	6
		6
162	9	0

106.

	£	*s.*	*d.*		£	*s.*	*d.*	
1.	43	12	2¼	× 14.	*11.*	731	4	3½ × 63.
2.	81	15	3½	× 21.	*12.*	372	11	7½ × 72.
3.	73	12	8	× 32.	*13.*	648	0	8 × 81.
4.	18	9	1¾	× 18.	*14.*	315	2	7½ × 108.
5.	91	5	6½	× 15.	*15.*	634	19	8½ × 42.
6.	64	12	2¼	× 28.	*16.*	437	0	0¾ × 121.
7.	13	4	10	× 35.	*17.*	598	3	4 × 144.
8.	21	3	6¾	× 25.	*18.*	834	17	2¼ × 84.
9.	58	9	11¼	× 36.	*19.*	312	10	11½ × 99.
10.	39	10	0½	× 27.	*20.*	406	0	7¾ × 132.

107.

	£	*s.*	*d.*			£	*s.*	*d.*	
1.	13	7	5	× 70.	*6.*	52	7	5¼	× 200.
2.	143	9	6½	× 90.	*7.*	371	14	1½	× 800.
3.	9	17	8¼	× 60.	*8.*	409	8	11¼	× 300.
4.	10	10	10¼	× 40.	*9.*	258	3	9	× 1200.
5.	431	3	8¾	× 50.	*10.*	630	18	0¾	× 1000.

When the multiplier is not the product of two convenient factors, the method used in the following example may often be applied.

Example.—Multiply £17 3*s.* 8¾*d.* by 59.

Since 59 is 56 + 3, or 7 × 8 + 3, we shall take 59 times the given sum if we multiply first by 56 and then by 3, and add the two results together: to multiply by 56 we use the factors 8 and 7.

£	*s.*	*d.*		£	*s.*	*d.*
17	3	8¾				
		7				
120	6	1¼				
		8				
962	8	10	= 56 times	17	3	8¾
51	11	2¼	= 3 times	17	3	8¾
1014	0	0¼	= 59 times	17	3	8¾

108.

	£	*s.*	*d.*		£	*s.*	*d.*	
1.	3	19	7½	× 23.	*14.*	12	19	11½	× 149.
2.	5	4	2¼	× 31.	*15.*	20	12	6	× 123.
3.	17	11	3½	× 37.	*16.*	83	15	0¾	× 111.
4.	23	4	5¼	× 39.	*17.*	61	18	2	× 91.
5.	53	7	7	× 65.	*18.*	90	9	6¼	× 75.
6.	25	13	4½	× 19.	*19.*	86	3	9½	× 107.
7.	61	7	8¼	× 17.	*20.*	37	7	10¾	× 153.
8.	38	3	6	× 43.	*21.*	2	6	3½	× 47.
9.	53	9	10¾	× 51.	*22.*	13	15	0¼	× 101.
10.	93	15	1½	× 86.	*23.*	9	7	3	× 83.
11.	73	0	0½	× 109.	*24.*	52	0	0¾	× 97.
12.	58	3	8	× 78.	*25.*	10	13	7¼	× 137.
13.	94	12	10¼	× 137.	*26.*	3	19	1½	× 149.

When the multiplier is too large to be split up as in the last set of examples, one of the methods used in following page may always be applied.

Example.—Multiply £2 11*s.* 8*d.* by 2354.

	£	*s.*	*d.*	
(*a*)	2	11	8	
			10	
(*b*)	25	16	8	= 10 times line (*a*).
			10	
(*c*)	258	6	8	= 10 times line (*b*), or 100 times line (*a*).
			10	
(*d*)	2583	6	8	= 10 times line (*c*), or 1000 „
			2	
	5166	13	4	= twice line (*d*), or 2000 „
	775	0	0	= 3 times line (*e*), or 300 „
	129	3	4	= 5 times line (*b*), or 50 „
	10	6	8	= „ „ 4 „
	6081	3	4	= „ „ 2354 „

The following is a shorter method of working the sum.

2354
8
12)18832*d.* = 8*d.* × 2354.
1569*s.* 4*d.*
25894*s.* = 11*s.* × 2354.
2,0)27463*s.* 4*d.*
£1373 3*s.* 4*d.*
4708 = £2 × 2354.
£6081 3*s.* 4*d.*

Here the pence, shillings, &c., have been each multiplied separately by 2354, just as in short multiplication, only on account of the largeness of the numbers each step has to be done on the paper instead of mentally.

109.

	£	s.	d.		£	s.	d.
1.	8	7	$9\frac{1}{2} \times 132$.	8.	531	3	$2\frac{1}{2} \times 1534$.
2.	12	13	$2\frac{1}{4} \times 375$.	9.	168	0	1×2685.
3.	31	8	7×632.	10.	736	17	$2\frac{3}{4} \times 5329$.
4.	53	12	$5\frac{1}{2} \times 129$.	11.	810	3	$8\frac{1}{4} \times 7435$.
5.	38	14	$1\frac{1}{4} \times 351$.	12.	586	11	7×9824.
6.	50	0	$11\frac{1}{2} \times 736$.	13.	141	19	$8\frac{3}{4} \times 2638$.
7.	82	19	$4\frac{3}{4} \times 834$.	14.	642	6	$4\frac{1}{2} \times 3127$.

110.

	£	s.	d.		£	s.	d.
1.	69	4	$3\frac{1}{2} \times 250$.	6.	438	15	8×3005.
2.	88	17	$6\frac{1}{2} \times 302$.	7.	672	8	$7\frac{1}{2} \times 7400$.
3.	32	15	$2\frac{1}{4} \times 707$.	8.	181	1	$0\frac{3}{4} \times 8060$.
4.	142	3	$8\frac{3}{4} \times 530$.	9.	530	0	$5\frac{1}{2} \times 6309$.
5.	840	10	$9\frac{1}{4} \times 690$.	10.	794	18	$0\frac{1}{4} \times 9027$.

111.

1. 150 labourers are employed in making a railway; how much will be required to pay them for one week, each man's wages being £1 1*s.* 6*d.*

2. What is the cost of making a railway 51 miles long, if each mile costs £9362 10*s.*

3. What sum must be divided among 31 men so that each shall receive £2 3*s.* $6\frac{3}{4}$*d.*

4. A butcher makes a profit of £1 13*s.* $4\frac{1}{4}$*d.* on every bullock he kills; if he kill 92 in a year, what profit does he make out of them all?

5. If bricks cost £2 5*s.* 3*d.* per thousand, how much will the bricks cost to build a house requiring fifty-three thousand?

6. Find the cost of four dozen bottles of wine at 3*s.* 5½*d.* per bottle.

7. If it costs 5*s.* 11¾*d.* to feed a boy for a week, what will be the weekly expense of feeding a school of 250 boys; and if there are 35 weeks of school in the year, what will be the yearly expense?

8. If a ship carries 964 tons of cargo, and the charge for freight is 6*s.* 4¼*d.* per ton, how much should her owners receive for the voyage?

9. Of what sum of money is £7 19*s.* 5¾*d.* the 137th part?

10. One 37th part of an estate is worth £314 10*s.* 11*d*; what is the value of the whole?

11. Find the cost of 934 tons of iron at £4 15*s.* 3*d.* per ton.

12. How much will four dozen and five bottles of wine cost at 6*s.* 5½*d.* a bottle?

DIVISION OF MONEY.

Two totally distinct ideas are included in division of concrete quantities, according as the divisor is itself a concrete quantity like the dividend, or an abstract number. If the divisor be a concrete quantity, the operation of division gives an answer to the question, "How many times is the divisor contained in the dividend?" the quotient in this case being an abstract number. If the divisor be an abstract number, the quotient is such a quantity that when multiplied by the divisor it gives the dividend, and hence it must be a concrete quantity of the same kind as the dividend.

When the divisor is an abstract number not greater than 12, we may proceed by short division, writing down the result figure by figure.

Example.—Divide £26 7*s.* 4*d.* by 7.

Dividing £26 by 7 we see that £3 is the largest number of pounds contained 7 times in £26; we put down 3 therefore in the pounds place of the quotient. The remainder £5 is brought to shillings and the 7*s.* added, giving 107*s.*, which divided by 7 gives a quotient 15*s.* and a remainder 2*s.*; the 15*s.* is put down in the shillings place, and the 2*s.* brought to pence, giving with the 4*d.* 28 pence, dividing which by 7 we have 4*d.* and no remainder.

£	*s.*	*d.*
7)26	7	4
3	15	4

112.

	d.
1.	$6\frac{3}{4} \div 9.$
2.	$5\frac{1}{2} \div 11.$
3.	$9 \div 12.$
4.	$2 \div 8.$
5.	$8\frac{1}{2} \div 2.$
6.	$8\frac{1}{4} \div 3.$
7.	$10\frac{1}{2} \div 7.$
8.	$11\frac{1}{4} \div 5.$
9.	$11 \div 4.$
10.	$11\frac{1}{4} \div 3.$

113.

	s.	*d.*
1.	18	$3 \div 3.$
2.	11	$2 \div 2.$
3.	10	$6 \div 7.$
4.	14	$2 \div 5.$
5.	12	$10 \div 11.$
6.	15	$6 \div 6.$
7.	13	$9 \div 5.$
8.	19	$6 \div 9.$
9.	17	$4 \div 4.$
10.	15	$4 \div 8.$

114.

	s.	*d.*
1.	16	$5\frac{1}{2} \div 5.$
2.	14	$6\frac{3}{4} \div 3.$
3.	17	$10\frac{1}{2} \div 2.$
4.	18	$1\frac{1}{2} \div 10.$
5.	15	$10\frac{1}{2} \div 6.$
6.	19	$11\frac{1}{4} \div 11.$
7.	18	$11\frac{1}{2} \div 7.$
8.	16	$8\frac{1}{4} \div 9.$
9.	17	$3\frac{1}{2} \div 5.$
10.	19	$11\frac{3}{4} \div 7.$

115.

	£	*s.*	*d.*
1.	7	2	$6 \div 3.$
2.	22	16	$8 \div 4.$
3.	32	17	$1 \div 5.$
4.	11	5	$9 \div 7.$
5.	30	9	$4 \div 8.$
6.	64	8	$6 \div 9.$
7.	22	15	$10 \div 10.$
8.	45	3	$6 \div 6.$
9.	15	16	$3 \div 11.$
10.	17	7	$4 \div 8.$

116.

	£	s.	d.	
1.	16	5	$6\frac{3}{4}$	÷ 3.
2.	53	5	$5\frac{1}{2}$	÷ 7.
3.	59	13	$5\frac{1}{4}$	÷ 9.
4.	85	18	$6\frac{1}{2}$	÷ 10.
5.	14	15	$10\frac{1}{2}$	÷ 6.
6.	48	8	$1\frac{1}{2}$	÷ 5.
7.	82	19	$4\frac{3}{4}$	÷ 11.
8.	87	11	$7\frac{1}{2}$	÷ 9.
9.	67	19	$9\frac{1}{2}$	÷ 10.
10.	89	7	$5\frac{3}{4}$	÷ 7.
11.	76	10	$11\frac{1}{4}$	÷ 5.
12.	67	1	$10\frac{1}{2}$	÷ 6.

117.

	£	s.	d.	
1.	37	3	0	÷ 8.
2.	68	0	$7\frac{1}{2}$	÷ 5.
3.	93	0	$11\frac{1}{4}$	÷ 9.
4.	81	0	0	÷ 8.
5.	76	19	3	÷ 12.
6.	50	14	7	÷ 4.
7.	48	10	$0\frac{3}{4}$	÷ 11.
8.	56	19	$11\frac{1}{4}$	÷ 3.
9.	75	0	9	÷ 12.
10.	91	0	$0\frac{3}{4}$	÷ 9.
11.	14	0	$1\frac{1}{2}$	÷ 6.
12.	97	0	2	÷ 8.

118.

	£	s.	d.	
1.	670	7	0	÷ 8.
2.	237	11	$9\frac{3}{4}$	÷ 3.
3.	785	9	$4\frac{1}{2}$	÷ 10.
4.	671	8	$8\frac{1}{2}$	÷ 11.
5.	395	11	$2\frac{1}{4}$	÷ 9.
6.	204	0	$6\frac{3}{4}$	÷ 7.
7.	233	8	9	÷ 6.
8.	434	19	$10\frac{3}{4}$	÷ 5.
9.	567	3	8	÷ 8.
10.	452	5	9	÷ 12.
11.	3807	13	$1\frac{1}{2}$	÷ 6.
12.	3608	19	$4\frac{1}{2}$	÷ 5.
13.	6887	14	$0\frac{1}{4}$	÷ 7.
14.	6422	13	0	÷ 8.
15.	3699	12	11	÷ 4.
16.	7615	11	9	÷ 12.
17.	1655	14	$4\frac{1}{2}$	÷ 9.
18.	3970	11	$0\frac{3}{4}$	÷ 11.
19.	4039	1	$0\frac{1}{2}$	÷ 10.
20.	1127	7	0	÷ 12.
21.	1442	19	5	÷ 11.
22.	3147	16	$8\frac{1}{4}$	÷ 9.
23.	2184	1	0	÷ 8.
24.	5079	19	$9\frac{1}{2}$	÷ 10.

When the divisor is the product of two or more factors, none of which is greater than 12, we may divide by each in turn; the last quotient will be the required result.

Example.—Find the 27th part of £957 6*s.* 4½*d.*

Since 9 times 3 are 27, there must be 9 27th parts in each 3rd part, therefore we may first divide by 3 to find the 3rd part, and then divide this 3rd part by 9 to find the 27th part.

	£	*s.*	*d.*
3)	957	6	4½
9)	319	2	1½
	35	9	1½

119.

	£	*s.*	*d.*			£	*s.*	*d.*	
1.	897	2	0	÷16.	*11.*	30113	8	4	÷56.
2.	1471	19	4½	÷18.	*12.*	39569	0	0	÷64.
3.	1036	4	9¾	÷21.	*13.*	26939	3	10½	÷63.
4.	2398	12	6	÷24.	*14.*	57735	19	6	÷72.
5.	1884	0	5	÷28.	*15.*	28708	8	4	÷80.
6.	4360	19	5¾	÷35.	*16.*	18780	10	1½	÷99.
7.	6690	19	6	÷36.	*17.*	17604	6	9	÷108.
8.	8545	7	6	÷40.	*18.*	33971	0	0½	÷121.
9.	3117	19	7¾	÷49.	*19.*	74435	15	3	÷132.
10.	2622	7	11	÷50.	*20.*	30235	19	0	÷144.

120.

	£	*s.*	*d.*	
1.	2178	6	8	÷160.
2.	17037	4	9½	÷250.
3.	18591	0	0	÷360.
4.	8295	17	6	÷420.
5.	16890	9	4½	÷450.
6.	17156	16	3	÷810.
7.	14871	5	0	÷1200.
8.	23561	9	2	÷1000.
9.	15163	19	2	÷1100.

When the divisor is greater than 12 and cannot be conveniently split up into factors, we must proceed by the

method of long division, which differs from short division only in writing down all the steps of the working, instead of doing them in the head and putting down only the result.

Example.—Divide £138 17*s.* 3½*d.* by 37.

£	*s.*	*d.*	£	*s.*	*d.*
37) 138	17	3½	(3	15	0½
111					
27					
20					
557	(15	*s.*			
37					
187					
185					
2					
12					
27	(0	*d.*			
4					
111	(3	*f.*			
111					

The £138 is first divided by 37, giving a quotient 3 and remainder 27. The remainder £27 is brought to shillings and the 17*s.* added, giving 557*s.*; this divided by 37 gives quotient 15 and remainder 2. The same method is followed until the division is completed.

121.

	£	*s.*	*d.*		£	*s.*	*d.*
1.	155	18	8½ ÷ 29.	*11.*	4429	19	7 ÷ 74.
2.	76	4	9¾ ÷ 31.	*12.*	6907	11	3¼ ÷ 91.
3.	154	19	4½ ÷ 19.	*13.*	7510	2	7 ÷ 86.
4.	152	10	10¼ ÷ 23.	*14.*	6997	5	3¾ ÷ 75.
5.	458	1	9½ ÷ 41.	*15.*	3781	19	9½ ÷ 97.
6.	544	5	3¼ ÷ 43.	*16.*	3919	5	7 ÷ 68.
7.	563	9	4½ ÷ 57.	*17.*	1639	6	9½ ÷ 59.
8.	759	5	2¼ ÷ 61.	*18.*	5492	13	9¾ ÷ 89.
9.	826	14	9 ÷ 38.	*19.*	4202	5	10½ ÷ 51.
10.	939	19	0¼ ÷ 47.	*20.*	8083	14	1½ ÷ 94.

122.

	£	s.	d.	
1.	108069	9	11	÷173.
2.	169377	12	3	÷211.
3.	12850	10	2½	÷205.
4.	54656	17	6	÷651.
5.	15066	7	4	÷304.
6.	168519	3	7½	÷317.
7.	180975	5	1¾	÷283.
8.	87905	14	3	÷276.
9.	117657	12	1	÷275.
10.	535524	8	1	÷614.
11.	44299	15	10	÷370.
12.	69075	12	8½	÷455.
13.	68518	10	3	÷258.
14.	83967	3	9	÷225.
15.	505557	10	10½	÷951.
16.	212061	19	7	÷590.
17.	296942	0	2¼	÷473.
18.	517126	1	10½	÷735.
19.	124041	7	8½	÷827.
20.	640190	7	7½	÷654.

123.

	£	s.	d.	
1.	46370	12	8½	÷5231.
2.	91344	19	1	÷6041.
3.	53216	2	8	÷2056.
4.	443442	0	6	÷5304.
5.	160978	8	7½	÷7329.
6.	142502	5	0	÷1035.
7.	297528	4	9½	÷1439.
8.	629920	10	0	÷3168.
9.	828499	3	4½	÷2607.
10.	472563	16	3¾	÷2179.

124.

	£	s.	d.	
1.	226	13	6½	÷235.
2.	499	18	4¼	÷871.
3.	134	0	8¼	÷3759.
4.	3322	6	3	÷4230.
5.	3723	14	6¼	÷7463.
6.	842	3	9	÷980.
7.	1531	10	5	÷1630.
8.	3701	17	9¾	÷8997.
9.	5307	14	2	÷7300.
10.	4620	2	3½	÷6710.

125.

	£	s.	d.	
1.	5429	7	5½	÷67.
2.	5158	1	1½	÷82.
3.	6599	12	2¼	÷93.
4.	1954	11	2½	÷101.
5.	4197	11	10¾	÷131.
6.	5431	18	10½	÷213.
7.	31944	14	8	÷352.
8.	14121	19	7¾	÷463.
9.	9572	15	2½	÷563.
10.	12533	15	8¾	÷151.

125. *(Continued.)*

	£	s.	d.			£	s.	d.	
11.	6358	7	$9\frac{1}{2}$	÷187.	*16.*	99139	6	$5\frac{3}{4}$	÷1271.
12.	382233	14	$4\frac{1}{2}$	÷830.	*17.*	329336	15	5	÷2050.
13.	497953	14	$3\frac{1}{2}$	÷607.	*18.*	281739	19	$4\frac{1}{2}$	÷3506.
14.	345556	10	$9\frac{1}{4}$	÷493.	*19.*	963094	17	10	÷4376.
15.	783145	12	1	÷290.	*20.*	1989239	1	3	÷5100.

126.

1. Find the 8th part of £300 10*s.* 2*d.*

2. If 12 yards of cloth cost £2 11*s.* 9*d.*, how much is that per yard?

3. If 9 men receive £8 7*s.* $9\frac{3}{4}$*d.* for a week's work, how much is that each?

4. £141 14*s.* 6*d.* is to be divided equally among 8 men; how much will each receive?

5. What sum of money multiplied by 7 will give £836 14*s.* $2\frac{3}{4}$*d.*?

6. If six dozen articles cost £12 9*s.*, how much does one cost?

7. Find the 100th part of £1071 0*s.* 10*d.*

8. A road 17 miles long costs £5316 17*s.* 10*d.*; how much is that per mile?

9. If 4 stones of pork cost 35*s.*, how much is that per pound? A stone is 14 pounds.

10. A herd of 137 oxen is worth £1327 15*s.* 2*d.*; what is the value of one ox?

When the divisor is a concrete quantity like the dividend, and we require to know how many times it is contained in the dividend, both divisor and dividend must be reduced to the same denomination; that is, both must be expressed in shillings, pence, &c., and the division performed exactly as in simple long division.

Example.—How often is 16*s.* 5½*d.* contained in £267 8*s.* 11½*d.*?

s.	*d.*
16	5½
12	
197	
2	
395	

£	*s.*	*d.*
267	8	11½
20		
5348		
12		
64187		
2		
128375		

Both divisor and dividend are first reduced to halfpence, giving 395 and 128375 respectively, then 128375 is divided by 395 in the ordinary manner.

395) 128375 (325
1185
987
790
1975
1975

127.

	£	*s.*	*d.*		£	*s.*	*d.*
1.	316	6	9¾	÷	7	8¼.	
2.	221	14	7	÷	6	0½.	
3.	2325	14	11½	÷	15	3¼.	
4.	2186	19	0	÷	1	3	10½.
5.	312038	2	0	÷	38	14	0.
6.	10156	2	6	÷	12	15	6.
7.	1374	16	5¼	÷	3	17	0¼.
8.	350164	17	3¾	÷	58	0	0¾.
9.	22812	10	0	÷	3	2	6.
10.	30618	5	0½	÷	315	13	0½.
11.	226374	2	6	÷	73	14	9.
12.	144964	13	9	÷	105	0	11¼.
13.	74363	1	3	÷	30	12	0½.
14.	18478	17	0	÷	236	18	2.
15.	474408	16	6	÷	630	0	6.
16.	30113	8	4	÷	537	14	9½.

127. *(Continued.)*

	£	s.	d.		£	s.	d.
17.	53878	7	9	÷	427	12	$1\frac{1}{2}$.
18.	115471	19	0	÷	801	17	$9\frac{1}{4}$.
19.	56341	10	$4\frac{1}{2}$	÷	189	14	$0\frac{1}{2}$.
20.	35208	13	6	÷	163	0	$0\frac{3}{4}$.

128.

1. How often is $11\frac{3}{4}d.$ contained in £40 14*s.* 8*d.*?

2. How many yards of silk worth 9*s.* $7\frac{1}{2}d.$ per yard can be bought for £45 14*s.* $4\frac{1}{2}d.$?

3. Into how many equal portions of £15 12*s.* 6*d.* can £1000 be divided?

4. How many tons of coal at £1 5*s.* a ton can be bought for £175?

5. What part is £13 5*s.* 6*d.* of £278 15*s.* 6*d.*?

6. How many half-guineas are there in £936 12*s.*?

7. What must £1 7*s.* 10*d.* be multiplied by so as to become £68 3*s.* 10*d.*?

8. How many cows at £11 3*s.* 5*d.* each can I buy with £100, and how much money shall I have left over?

9. What part of £3183 16*s.* $6\frac{3}{4}d.$ is £38 7*s.* $2\frac{1}{4}d.$?

10. How many fowls worth 3*s.* $4\frac{1}{2}d.$ each can I buy for £5, and how much change shall I have?

11. If it cost £10352 10*s.* to maintain an army for one day, for how many days' expense will £331280 pay?

12. How many times successively can £12 9*s.* $3\frac{1}{2}d.$ be subtracted from £1000, and what will be the final remainder?

13. How many equal shares of £2 19*s.* $3\frac{1}{2}d.$ can be made out of £223, and how much will remain over?

MISCELLANEOUS EXAMPLES.

129.

1. Find the difference between £1000 and 1000 guineas.

2. A man has three five pound notes, twenty-one sovereigns, six half-sovereigns, seven half-crowns, eleven florins, eighteen shillings, thirty-one sixpences, thirteen threepenny-pieces; how much has he altogether?

3. By how much does the sum of £234 16*s.* 5¼*d.* and £81 3*s.* 11¾*d.* exceed their difference?

4. A man's income is £593 8*s.* 5*d.* a year, out of which he spends £351 19*s.* 10*d.*; how much will he save in ten years?

5. Add together the 5th, 16th, and 24th parts of £178 10*s.*

6. In an office it was found that during one year there had been used 7322 penny postage stamps, 517 halfpenny ones, 183 twopenny ones, and 87 threepenny ones; how much was spent in postage for the year?

7. In a factory are employed 83 men at 23*s.* 6*d.* a week, 31 women at 14*s.* 3*d.*, and 27 boys at 6*s.* 4*d.*; how much do their wages for one week amount to? How much for 52 weeks?

8. By how much does 9 times £30 0*s.* 2¼*d.* exceed the 9th part of the same sum?

9. Find the difference in the value of two farms, one of which consists of 250 acres, worth £140 10*s.* an acre, the other of 325 acres, worth £78 5*s.* 6*d.* an acre.

10. A draper buys 93 yards of cloth for £23 17*s.* 6*d.*, and sells it at 4*s.* 7½*d.* a yard; what profit does he make?

11. A man works three days a week, receiving 7*s.* 6*d.* per day, and spends at the rate of 3*s.* 2¼*d.* per day; how much will he save in three weeks?

12. A man leaves by will £5362, of which one-third is to go to his widow, one fourth to his eldest son, and the rest is to be divided equally among his four daughters; how much did each daughter receive?

13. Find the profit on 321 articles bought at £1 5*s.* 9½*d.* each, and sold at £1 12*s.* 3*d.* each?

14. A man buys a piece of land for £7632 10*s.*; he divides it into 23 equal plots for building, which he sells at £381 5*s.* each; what profit does he make?

15. By how much does the value of 831 half-guineas exceed the value of 10829 threepenny-pieces?

16. A woman had 26*s.* 3*d.*; if she spends one-sixth of her money at one shop and one-tenth at a second, how much has she left?

17. A grocer buys 237 lbs. of tea for £25 18*s.* 5¼*d.*, for how much must he sell it so as to gain 2*d.* per pound?

18. 17 gallons of spirit worth 18*s.* 9*d.* per gallon are mixed with 13 gallons worth 16*s.* 3*d.* per gallon; what is the value of the whole lot? What is the value of one gallon of the mixture?

19. 34 lbs. of tea worth 3*s.* 9¾*d.* per lb. are mixed with 27 lbs. worth 2*s.* 6½*d.*; what is the value of one pound of the mixture?

20. 7 chickens and 5 ducks cost £1 16*s.* 2*d.*, the ducks cost 3*s.* 2½*d.* each; what was the price of a chicken?

21. Divide £20 among 12 people so that one of them may have 10*s.* more than each of the others?

22. If 5 chairs cost £1 17*s.* 6*d.*, how much will 17 cost? (Divide by 5 to find cost of one, then multiply by 17.)

23. If 11 young pigs cost £8 9*s.* 7*d.*, how much will 30 cost?

24. If a chest of tea weighing 121 pounds cost £15 2*s.* 6*d.*, how much will 53 pounds cost?

25. If a man earn £22 5*s.* in 20 weeks, how much will he earn in 52 weeks?

26. If a score sacks of potatoes cost £19 3*s.* 9*d.*, how much must be given for a dozen sacks? How much for a hundred?

27. If I pay £2 3*s.* 6*d.* for a railway journey of 232 miles, how much ought I to pay for travelling 137 miles?

28. If eggs cost 10*s.* 5*d.* per hundred, how much are they a dozen?

29. If 137 acres of land be sold for £16936 12*s.* 6*d.*, what should be the price of 73 acres of the same land?

30. If the rent of 29 acres of land be £145 12*s.* 1*d.* a-year, what should be the rent of 94 acres of the same land?

31. What will 55 quarters of wheat cost at £3 3*s.* 6*d.* per quarter, and how many quarters of oats at £1 7*s.* 6*d.* per quarter should be given in exchange for it?

32. How many pigs at £2 16*s.* 3*d.* each are equal in value to 225 sheep at £3 5*s.* 9*d.* each?

33. A pipe of wine or 126 gallons is bought for £132 15*s.*; if 8 gallons be lost by leakage, for how much per gallon must the remainder be sold so as not to lose or gain?

34. A draper buys 340 yards of velvet at 7*s.* 10*d.* per yard; at what price per yard must he sell it so as to gain a profit of £7 8*s.* 9*d.*?

35. What sum is contained 137 times in £59640 with a remainder of £27 17*s.* 6*d.*?

REDUCTION—WEIGHTS AND MEASURES.

Reduction of weights and measures is effected exactly in the same manner as reduction of money, using the values of the different units contained in the tables. A few examples will make the methods clear.

How many pounds are there in 4 tons 3 cwts. 2 qrs.?

The 4 tons are reduced to cwts. by multiplying by 20, and the 3 cwts. added, making 83 cwt., which are brought to qrs. by multiplying by 4, and the 2 qrs. added; finally, the qrs. are reduced to lbs. by multiplying by 28.

Tons.	cwts.	qrs.
4	3	2
20		
83 cwts.		
4		
334 qrs.		
28		
2672		
668		
9352 lbs.		

How many miles are there in 73461 yds.?

Dividing by 220, we obtain 333 furlongs and 201 yds.; then the furlongs are expressed as miles by dividing by 8.

```
22,0)7346,1(333 f.
     66
     ---
      74
      66
      --
       86
       66
       --
      201 yds.
8)333 f. 201 yds.
  41 m. 5 f. 201 yds.
```

130. Measures of Length.

1. 352 yds. 2 ft. to ft.
2. 75 yds. 1 ft. 8 in. to in.
3. 6783 in. to poles.
4. 3 m. 5 f. to yards.
5. 18 m. 7 f. 3 yds. to in.
6. 15 yds. 3 qrs. 2 n. to nails.

7. 74 yds. 1 n. to nails.
8. 894 fathoms to yards.
9. 175 chains to yards.
10. 63 m. 5 yds. to inches.
11. 1295 in. to yards.
12. 60031 poles to miles.
13. 163680 yds. to nails.
14. 16553 ft. to miles.
15. 1389 nails to yards.
16. 6974 yds. to chains.
17. 8397 links to chains.
18. 6163 nails to yards.
19. 82204 in. to miles.
20. 444610 in. to miles.

131. Avoirdupois Weight.

1. 21 t. 3 cwt. to hundredweights.
2. 15 cwt. 3 qrs. to pounds.
3. 3 qrs. 4 lbs. 11 oz. to ounces.
4. 5 lbs. 2 oz. 3 drs. to drams.
5. 3 qrs. 4 oz. to ounces.
6. 31 t. 1 cwt. 3 oz. to ounces.
7. 18 t. 17 cwt. 3 qrs. 16 lbs. to pounds.
8. 19 cwt. 3 lbs. to drams.
9. 255 drs. to ounces.
10. 1352 oz. to quarters.
11. 6087 drs. to pounds.
12. 2141 lbs. to hundredweights.
13. 3549 drs. to pounds.
14. 1219013 oz. to tons.
15. 14536 drs. to quarters.
16. 1079718 lbs. to tons.

132. Apothecaries' Weight.

1. 15 lbs. 6 oz. to drams.
2. 5 oz. 3 drs. 1 sc. to scruples.
3. 10 oz. 7 drs. 2 sc. to grains.
4. 9 oz. 2 sc. to scruples.
5. 6 drs. 1 sc. 17 grs. to grains.
6. 697 grs. to ounces.
7. 8142 drs. to pounds.
8. 5719 grs. to ounces.
9. 34777 grs. to pounds.
10. 120972 grs. to pounds.

133. Troy Weight.

1. 3 oz. 2 dwts. to pennyweights.
2. 6 lbs. 10 oz. 19 dwts. to pennyweights.
3. 83 lbs. 2 dwts. to grains.
4. 5 lbs. 17 oz. 22 grs. to grains.
5. 19 lbs. 19 dwts. to pennyweights.
6. 2539 dwts. to pounds.
7. 5523 grs. to ounces.
8. 7769221 grs. to pounds.
9. 239949 dwts. to pounds.
10. 749112 grs. to pounds.

134. Time.

1. 3 w. 4 d. to hours.
2. 29 d. 6 h. to minutes.
3. 6 d. 12 h. 28 m. to minutes.
4. 8 h. 51 m. 59 s. to seconds.
5. 3 w. 2 d. 21 s. to seconds.
6. 8183 h. to days.
7. 1054202 m. to weeks.
8. 94608000 s. to days.
9. 524159 m. to weeks.

135. Dry Measure.

1. 13 qrs. 5 bush. to gallons.
2. 5 qrs. 7 bush. 3 pks. to pints.
3. 16 qrs. 1 gal. 1 qt. to quarts.
4. 4 bush. 2 pks. 1 pt. to pints.
5. 32 qrs. 3 pks. to pecks.
6. 366 qts. to bushels.
7. 761 gals. to quarters.
8. 8255 qts. to quarters.
9. 463 pts. to bushels.
10. 37062 pts. to quarters.

136. Liquid Measure.

1. 28 gals. 3 qts. 1 pt. to pints.
2. 40 gals. 1 pt. 3 gills to gills.
3. 2 hhds. 51 gals. to quarts (beer).
4. 1 hhd. 61 gals. to quarts (wine).
5. 1 hhd. 3 gals. 1 pt. to gills (beer).
6. 247 pts. to gallons.
7. 955 gills to gallons.
8. 553 qts. to hhds. (beer).
9. 5672 gills to hhds. (wine).
10. 1625 gills to gallons.

137. Apothecaries' Fluid Measure.

1. 2 oz. 3 drs. 25 min. to minims.
2. 7 oz. 59 min. to minims.
3. 4 oz. 6 drs. to minims.
4. 3112 min. to ounces.
5. 6252 min. to ounces.
6. 25860 min. to ounces.

138. Surface.

1. 15 yds. 7 ft. 102 in. to ins.
2. 8 yds. 69 in. to inches.
3. 34 yds. 8 ft. to inches.
4. 4 a. 3 r. 32 p. to poles.
5. 56 a. 15 p. to poles.
6. 14 a. 2 r. to poles.
7. 901 p. to acres.
8. 5935 p. to acres.
9. 21759 p. to acres.
10. 4811 in. to yards.
11. 40310 in. to yards.
12. 227664 in. to yards.

139. Solidity.

1. 356 yds. to feet.
2. 15 ft. 9 in. to inches.
3. 100 yds. 23 ft. 1009 in. to inches.
4. 63 yds. 1721 in. to inches.
5. 9277 in. to feet.
6. 20441 ft. to yards.
7. 139392 in. to yards.
8. 148942 in. to yards.

Examples will now be given of questions requiring both multiplication and division for their solution.

Reduce 23 poles to yards.

Since one pole contains $5\frac{1}{2}$ yards or 11 half-yards, we first bring the poles to half-yards by multiplying by 11; then divide by 2 to bring to yards. We thus obtain 126 yards, and half a yard, or 1 ft. 6 in.

23 poles.
11
2)253 half-yards
126 yds. 1 ft. 6 ins.

Reduce 184 inches to nails.

Since 1 nail is $2\frac{1}{4}$ inches, or 9 quarter-inches, we first bring the inches to quarter-inches, then divide by 9 to bring these to nails; in the division there are 7 quarter-inches over, or $1\frac{3}{4}$ in.

184 in.
4
9)736 quarter-inches.
84 n. $1\frac{3}{4}$ in.

Express in Troy weight 17 lbs. Avoirdupois.

7000 grains Troy make one pound avoirdupois, therefore we multiply the 17 by 7000 to bring to grains, and then reduce these as in former examples to pounds, ounces, &c.

17 lbs.
7000
24)119000 grs.(4958 dwts.
96
230
216
140
120
200
192
8 grs.
20)4958 dwts.
12)247 oz. 18 dwts.
20 lbs. 7 oz. 18 dwts. 8 grs.

140.

1. 838 poles to yards.
2. 736 yards to poles.
3. 837 feet to poles.
4. 14 p. 3 yds. 2 ft. to feet.
5. 73842 inches to poles.
6. 93 inches to nails.
7. 736 nails to inches.
8. 5 yds. 2 qrs. 3 n. to inches.
9. 72 sq. poles to sq. yards.
10. 7139 square yards to square poles.
11. 95832 square inches to poles.
12. 2 qrs. Avoirdupois to Troy.
13. 3 lbs. 7 oz. 15 dwts. to Avoirdupois.

COMPOUND RULES—WEIGHTS & MEASURES.

Addition, subtraction, multiplication, and division of weights and measures are performed exactly in the same way as the same operations on money; no further explanation of principles is therefore needed, but worked-out examples will be placed at the head of each rule.

Examples involving fractional multipliers, such as $5\frac{1}{2}$ to bring poles to yards, $2\frac{1}{4}$ to bring nails to inches, &c., have been separated from the rest, and will be found on p. 135, for all the rules. Such questions are, however, of little *practical* importance.

ADDITION.

Example.—Adding the column of poles we have 68 p., or 1 f. 28 p.; the furlongs, with the 1 f. carried from the poles give 18 f., or 2 m. 2 f.; finally, the miles with the 2 m. carried, give 63 m.

m.	f.	p.
18	5	31
7	6	17
36	0	8
	6	12
63	2	28

141. Avoirdupois Weight.

	t.	cwts.	qrs.
1.	4	13	3
	3	7	2
	12	18	1
	8	17	2
	21	9	0

	cwts.	qrs.	lbs.
2.	2	1	26
	1	2	14
	5	1	12
	6	0	9
		1	25

	lbs.	oz.	drs.
3.	14	13	12
	5	2	15
	3	0	8
	1	14	11
	2	12	6

	t.	cwts.	qrs.	lbs.
4.	15	3	3	5
	3	14	0	23
	27	18	2	19
	4	6	1	26
	36	19	3	12
	8	3	2	9

	cwts.	qrs.	lbs.	oz.
5.	7	1	6	13
	6	2	14	7
		3	12	2
	18	1	22	11
	7	2	3	15
	14	1	16	10

	t.	cwts.	qrs.	lbs.
6.	26	14	3	23
	8	6	2	17
	35	10	3	4
		12	1	21
		3	0	8
			1	27

142. Troy Weight.

Add together—

1. 3 lbs. 4 oz. 16 dwt.; 7 lbs. 10 oz. 19 dwt.; 16 lbs. 3 oz. 12 dwt.; 24 lbs. 3 oz. 6 dwt.; 18 lbs. 11 oz. 17 dwt.

2. 8 oz. 14 dwt. 21 grs.; 10 oz. 19 dwt. 8 grs.; 3 oz. 12 dwt. 23 grs.; 11 oz. 7 dwt. 21 grs.; 7 oz. 6 dwt. 20 grs.; 8 oz. 2 dwt. 13 grs.

3. 3 lbs. 11 oz. 2 dwt. 14 grs.; 18 lbs. 4 dwt. 3 grs.; 5 lbs. 2 oz. 15 grs.; 21 lbs. 8 oz. 5 dwt. 16 grs.; 1 oz. 18 grs.; 4 lbs. 22 grs.

4. 16 lbs. 10 oz. 10 grs.; 3 lbs. 17 dwt. 21 grs.; 7 lbs. 4 dwt.; 32 lbs. 19 dwt. 12 grs.; 51 lbs. 9 oz.; 8 oz. 23 grs.

5. 13 lbs. 1 oz. 16 grs.; 2 lbs. 9 oz. 13 dwt.; 71 lbs. 10 oz. 22 grs.; 84 lbs. 3 oz. 19 dwt. 2 grs.; 7 oz. 12 dwt. 8 grs.; 4 lbs. 14 dwt. 14 grs.

6. 35 lbs. 10 oz. 14 dwt.; 52 lbs. 15 dwt. 6 grs.; 7 lbs. 5 oz. 13 grs.; 62 lbs. 11 oz. 16 grs.; 4 lbs. 3 oz. 13 dwt. 12 grs.; 5 lbs. 5 dwts.

143. Apothecaries' Weight.

Add together—

1. 3 oz. 4 drs. 2 sc. 17 grs.; 2 oz. 3 drs. 1 sc. 12 grs.; 1 oz. 7 drs. 1 sc. 12 grs.; 1 oz. 5 drs. 2 sc. 19 grs.; 3 oz. 2 drs. 1 sc. 4 grs.

2. 2 lbs. 7 oz. 3 drs. 1 sc.; 4 lbs. 6 drs. 2 sc.; 5 oz. 5 drs. 1 sc.; 8 lbs. 10 oz.; 11 oz. 4 drs. 1 sc.; 6 oz. 2 sc.

3. 52 lbs. 10 oz. 3 drs.; 21 lbs. 7 drs.; 5 lbs. 8 oz. 2 drs.; 17 lbs. 3 oz. 6 drs.; 36 lbs. 9 oz. 2 sc.; 71 lbs. 3 drs. 2 sc.

4. 8 lbs. 6 oz. 4 drs. 2 sc. 13 grs.; 3 lbs. 2 oz. 7 drs. 1 sc. 12 grs.; 8 oz. 5 drs. 12 grs.; 13 lbs. 7 drs. 19 grs.; 6 drs. 1 sc. 17 grs.

5. 3 oz. 2 drs. 14 grs.; 5 lbs. 4 oz. 7 drs. 1 sc.; 13 lbs. 5 drs. 6 grs.; 11 oz. 3 drs. 2 sc. 17 grs.; 4 oz. 3 drs. 2 sc.; 6 lbs. 8 oz. 2 sc. 19 grs.

6. 14 lbs. 8 oz. 7 drs.; 3 oz. 2 drs. 1 sc.; 4 drs. 12 grs.; 2 sc. 15 grs.; 6 drs. 1 sc. 5 grs.; 12 lbs. 3 drs. 9 grs.; 11 oz.; 2 sc. 15 grs.

144. Long Measure.

Find the sum of—

1. 16 m. 3 f. 21 p.; 53 m. 7 f. 36 p.; 8 m. 3 f. 12 p.; 72 m. 4 f. 31 p.; 3 m. 10 p.; 5 m. 6 f.

2. 16 yds. 2 ft. 7 in.; 14 yds. 1 ft. 7 in.; 3 yds. 5 in.; 7 yds. 4 in.; 2 yds. 2 ft. 6 in.; 1 yd. 11 in.

3. 53 m. 2 f. 6 p.; 9 m. 3 f. 21 p.; 1 m. 22 p.; 35 m. 5 f. 6 m. 2 f. 9 p.

4. 41 yds. 2 ft. 3 in.; 3 yds. 1 ft. 11 in.; 4 yds. 1 in.; 5 yds. 4 ft. 2 in.; 23 yds. 8 in.; 2 ft. 7 in.

5. 8 m. 3 f. 25 p.; 12 m. 7 f. 13 p.; 18 m. 30 p.; 48 m. 6 f.; 17 m. 4 f. 22 p.

6. 18 yds. 2 ft. 11 in.; 5 yds. 5 in.; 12 yds. 1 ft. 8 in.; 36 yds. 10 in.; 2 ft. 7 in.; 2 yds. 2 ft. 8 in.

145. Cloth Measure.

Add together—

1. 15 yds. 3 qrs. 2 n.; 4 yds. 1 qr. 3 n.; 23 yds. 2 qrs. 1 n.; 31 yds. 3 qrs. 3 n.

2. 51 yds. 1 qr. 2 n.; 3 qrs. 2 n.; 5 yds. 1 n.; 81 yds. 3 qrs.; 17 yds. 3 qrs. 2 n.; 63 yds. 1 qr. 1 n.

3. 7 yds. 3 qrs.; 18 yds. 1 n.; 31 yds. 3 qrs. 2 n.; 15 yds. 1 qr. 3 n.; 94 yds. 2 qrs. 2 n.; 78 yds. 3 n.

4. 67 yds. 3 qrs.; 76 yds. 3 n.; 3 qrs. 3 n.; 5 yds. 2 n.; 40 yds. 2 qrs. 2 n.; 37 yds. 1 qr. 3 n.

5. 81 yds. 3 qrs. 3 n.; 15 yds. 1 n.; 12 yds. 3 qrs.; 25 yds. 2 n.; 2 qrs. 1 n.; 3 qrs. 2 n.

6. 212 yds. 3 qrs.; 82 yds. 3 n.; 56 yds. 1 qr. 2 n.; 3 qrs. 1 n.; 2 qrs. 3 n.; 193 yds. 1 qr. 2 n.

146. Time.

Find the sum of—

1. 2 w. 4 d. 21 h.; 5 w. 6 d. 7 h. 30 m.; 12 w. 18 h. 16 m.; 4 w. 5 h. 17 m.; 4 d. 3 h. 29 m.

2. 2 h. 31 m. 15 sec.; 4 h. 32 sec.; 6 h. 14 m.; 1 h. 59 sec.; 3 h. 4 m. 32 sec.

3. 7 h. 8 m.; 6 h. 31 sec.; 42 m. 15 sec.; 3 h. 41 m. 45 sec.; 15 h. 11 sec.; 28 m. 3 sec.

4. 6 w. 3 d. 4 h.; 5 w. 3 h.; 7 d. 16 h.; 16 w. 5 d. 13 h.; 23 w. 2 d. 18 h.; 4 d. 23 h.

5. 3 d. 2 h. 32 m.; 5 d. 4 h. 15 sec.; 1 d. 39 m. 59 sec.; 1 d. 23 h. 43 sec.; 6 d. 13 m.; 4 h. 18 sec.

6. 21 h. 3 sec.; 53 m. 41 sec.; 8 h. 2 sec.; 13 h. 12 m.; 2 h. 47 sec.; 7 h. 59 m.; 37 m. 19 sec.

147. Surface.

Add together—

1. 3 yds. 5 ft. 41 in.; 7 yds. 8 ft. 53 in.; 6 yds. 3 ft. 104 in.; 1 yd. 1 ft. 17 in.; 15 yds. 4 ft. 23 in.

2. 33 yds. 2 ft. 10 in.; 7 ft. 132 in.; 10 yds. 7 ft.; 31 yds. 100 in.; 76 yds. 89 in.; 12 yds. 3 ft. 25 in.

3. 4 a. 3 r. 15 p.; 17 a. 1 r. 35 p.; 36 a. 2 r. 21 p.; 16 a. 1 r. 19 p.; 15 a. 37 p.; 3 r. 10 p.; 14 a. 1 r.

4. 12 a. 3 r.; 1 r. 37 p.; 13 a. 29 p.; 37 a. 3 r. 20 p.; 52 a. 2 r. 9 p.; 19 a. 32 p.

5. 35 a. 3 r. 14 p.; 21 a. 1 r. 17 p.; 2 r. 31 p.; 3 r. 8 p.; 58 a. 1 r. 29 p.; 72 a. 2 r.; 81 a. 38 p.

6. 3 yds. 7 ft. 135 in.; 7 yds. 143 in.; 2 yds. 2 ft. 8 in.; 5 yds. 5 ft. 69 in.; 1 yd. 4 ft. 127 in.; 6 yds. 58 in.; 3 ft. 9 in.

148. Solidity.

Add together—

1. 122 yds. 18 ft. 324 in.; 51 yds. 22 ft. 731 in.; 3 yds. 5 ft. 51 in.; 123 yds. 153 in.; 10 ft. 1000 in.

2. 43 yds. 5 ft.; 7 yds. 1631 in.; 15 ft. 460 in.; 8 yds. 12 ft. 742 in.; 65 yds. 18 ft. 356 in.

3. 123 yds. 24 ft. 325 in.; 465 yds. 1 ft. 81 in.; 72 yds. 117 in.; 48 yds. 26 ft. 1727 in.; 12 yds. 183 in.

4. 63 yds. 19 ft. 4 in.; 20 ft. 1500 in.; 37 ft. 357 in.; 52 yds. 3 ft.; 130 yds. 11 ft. 1200 in.; 160 yds. 4 ft.

149. Dry Measure.

Add together—

1. 15 qrs. 1 bush. 1 pk.; 23 qrs. 3 bush. 3 pks. 1 gal.; 5 qrs. 3 bush. 1 gal.; 20 qrs. 3 pks.; 6 bush. 3 pks.

2. 23 qrs. 3 bush.; 2 pks. 3 qrts.; 5 bush. 1 qrt.; 4 qrs. 3 bush. 2 pks. 1 gal. 2 qrts.

3. 2 pks. 1 gal. 1 qrt. 1 pt.; 1 pk. 3 qrts. 1 pt. 3 gills; 2 qrts. 1 pt. 2 gills; 1 gal. 2 qrts. 1 pt.; 3 pks. 3 qrts.

4. 63 qrs. 5 bush.; 81 qrs. 3 bush. 1 pk.; 179 qrs. 3 pks.; 18 qrs. 4 bush. 2 pks.; 93 qrs. 2 bush.

5. 1 gal. 3 qrts. 1 pt. 3 gills; 2 qrts. 2 gills; 1 pt. 1 gill; 1 gal. 2 gills; 2 qrts. 1 pt. 3 gills.

150. Liquid Measure.

Add together—

1. 17 gals. 2 qrts. 1 pt.; 52 gals. 3 qrts. 1 gill; 35 gals. 1 qrt. 1 pt.; 23 gals. 1 qrt. 3 gills; 3 qrts. 2 gills.

2. 5 gals. 3 qrts. 1 gill; 8 gals. 1 pt. 2 gills; 16 gals. 3 gills; 17 gals. 1 pt. 3 gills; 6 gals. 2 qrts. 1 gill.

3. 39 gals. 3 qrts. 1 pt.; 2 qrts. 3 gills; 3 gals. 1 pt.; 15 gals. 2 qrts.; 7 gals. 1 gill; 1 pt. 2 gills.

4. 12 gals. 1 qrt. 1 gill; 29 gals. 3 gills; 42 gals. 1 qrt.; 51 gals. 1 pt.; 37 gals. 3 qrts. 2 gills; 25 gals. 3 qrts.

151.

1. Three chests of tea contained respectively 1 cwt. 2 qrs. 19 lbs.; 2 cwt. 15 lbs.; 2 cwt. 1 qr. 3 lbs.; how much did they contain altogether?

2. What is the weight of three silver cups, of which the first contains 8 oz. 22 grs. of silver, the second 5 oz. 8 dwts. 13 grs., and the third as much as the other two together?

3. My garden consists of a lawn of 1 r. 3 p., a shrubbery of 2 r. 15 p., flower beds containing altogether 23 p., and a kitchen garden of 3 r. 12 p.; how much ground does the whole contain, allowing 19 p. for walks?

4. If a man can row at the rate of 4 m. 6 f. 21 p. an hour in still water, how far will he row in an hour down a river running at the rate of 2 m. 1 f. 27 p. an hour?

5. If I start for a walk at 5 minutes past 2 o'clock and remain out for 3 hours and 56 minutes, at what time do I return?

6. Find the whole length of the fence round a field of which two opposite sides are each 8 chains 53 links long, and the other two are each 10 chains 71 links long.

SUBTRACTION.

Example.—Find the difference between 17 cwt. 3 qrs. 9 lbs. and 12 cwt. 1 qr. 23 lbs.

Since we cannot take 23 lbs. from 9 lbs., we *borrow* 1 qr. or 28 lbs.; then 23 lbs. from 37 lbs. leaves 14 lbs. Remembering the 1 qr. that we *borrowed*, we take 2 qrs. from 3 qrs., leaving 1 qr. Finally, 12 cwt. from 17 cwt. leaves 5 cwt.

cwt.	qrs.	lbs.
17	3	9
12	1	23
5	1	14

152. Avoirdupois Weight.

1. 5 t. 15 cwt. 3 qrs. – 2 t. 17 cwt. 1 qr.
2. 17 t. 1 cwt. 2 qrs. 21 lbs. – 13 t. 12 cwt. 3 qrs. 27 lbs.
3. 5 t. 1 qr. – 2 t. 7 cwt. 2 qrs. 5 lbs.
4. 7 lbs. 13 oz. 5 drs. – 4 lbs. 14 oz. 3 drs.
5. 14 lbs. 14 drs. – 3 lbs. 10 oz. 15 drs.
6. 2 qrs. 12 lbs. 3 oz. – 1 qr. 17 lbs. 15 oz. 3 drs.

153. Troy Weight.

1. 5 lbs. 3 oz. 19 dwts. – 3 lbs. 5 oz. 15 dwts.
2. 14 lbs. 1 oz. 3 dwts. – 12 lbs. 1 oz. 13 dwts.
3. 11 oz. 15 dwts. 5 grs. – 3 oz. 14 dwts. 17 grs.
4. 19 lbs. 10 oz. 13 grs. – 15 lbs. 11 oz. 3 dwts. 23 grs.
5. 20 lbs. 20 grs. – 13 oz. 17 dwts. 21 grs.
6. 10 lbs. 5 oz. – 3 lbs. 10 oz. 8 dwts. 15 grs.

154. Apothecaries' Weight.

1. 5 lbs. 6 oz. 4 drs. 1 sc. – 1 lb. 6 oz. 3 drs. 2 sc.
2. 9 lbs. 3 oz. 5 drs. – 2 lbs. 9 oz. 12 grs.
3. 17 lbs. 2 oz. 7 drs. 1 sc. 3 grs. – 5 oz. 6 drs. 2 sc. 14 grs.
4. 7 oz. 12 grs. – 3 oz. 6 drs. 1 sc. 14 grs.
5. 2 lbs. 1 oz. 3 drs. 14 grs. – 11 oz. 4 drs. 1 sc. 16 grs.
6. 14 lbs. – 3 lbs. 7 oz. 3 drs. 15 grs.

155. Long Measure.

1. 15 m. 3 f. 5 p. – 2 m. 7 f. 14 p.
2. 14 yds. 1 ft. – 6 yds. 2 ft. 9 in.
3. 21 yds. 4 in. – 13 yds. 2 ft. 7 in.
4. 65 yds. 1 ft. 3 in. – 27 yds. 10 in.
5. 173 m. 7 f. 3 p. – 95 m. 7 f. 39 p.
6. 300 m. – 48 m. 7 f. 31 p.

156. Cloth Measure.

1. 17 yds. 2 qrs. 3 n. – 12 yds. 3 qrs. 2 n.
2. 53 yds. 1 n. – 40 yds. 2 qrs. 2 n.
3. 31 yds. 1 qr. – 17 yds. 3 qrs. 1 n.
4. 23 yds. 2 n. – 3 qrs. 3 n.
5. 57 yds. 1 qr. – 12 yds. 3 qrs. 2 n.
6. 32 yds. – 21 yds. 1 qr. 2 n.

157. Superficial Measure.

1. 350 a. 2 r. 29 p. – 231 a. 3 r. 35 p.
2. 756 a. 1 r. 16 p. – 387 a. 2 r. 20 p.
3. 83 a. 3 p. – 71 a. 3 r. 5 p.
4. 12 yds. 6 ft. 117 in. – 7 yds. 8 ft. 93 in.
5. 7 yds. 52 in. – 2 yds. 2 ft. 53 in.
6. 30 yds. 5 ft. – 19 yds. 3 ft. 118 in.

158. Solid Measure.

1. 75 yds. 21 ft. 1360 in. – 33 yds. 28 ft. 1120 in.
2. 36 yds. 3 ft. 75 in. – 21 yds. 10 ft. 100 in.
3. 68 yds. 123 in. – 51 yds. 20 ft. 356 in.
4. 539 yds. – 403 yds. 3 ft. 100 in.
5. 658 yds. 25 ft. – 184 yds. 10 ft. 1336 in.
6. 81 yds. 537 in. – 52 yds. 21 ft. 156 in.

159. Dry Measure.

1. 2 qrs. 7 bush. 2 pks. 1 gal. – 1 qr. 7 bush. 3 pks. 1 gal.
2. 16 qrs. 5 bush. – 7 qrs. 6 bush. 2 pks.
3. 64 qrs. 1 pk. – 53 qrs. 2 bush. 2 pks.

4. 3 bush. 1 pk. 3 qrts. 1 pt. – 1 bush. 2 pks. 2 qrts. 1 pt.
5. 7 bush. 3 pks. 1 pt. – 4 bush. 2 pks. 3 qrts.
6. 6 bush. – 4 bush. 3 pks. 1 gal. 2 qrts.

160. Liquid Measure.

1. 17 gal. 1 qrt. 1 pt. – 13 gals. 2 qrts.
2. 52 gals. 1 pt. – 39 gals. 2 qrts. 1 pt.
3. 25 gals. 2 qrts. 3 gills – 18 gals. 1 qrt. 1 pt. 2 gills.
4. 47 gals. 2 gills – 33 gals. 3 qrts. 3 gills.
5. 50 gals. 1 qrt. 1 gill – 28 gals. 2 qrts. 1 pt.
6. 37 gals. 3 qrts. 2 gills – 27 gals. 2 qrts. 1 pt. 3 gills.

161.

1. From an 18 gal. cask of beer 3 gals. 1 pt. 2 gills has leaked; how much remains?

2. A cheese weighing 48 lbs. 12 oz. is divided into two pieces, of which one weighs 19 lbs. 14 oz.; what is the weight of the other.

3. If I have to walk a distance of 20 m., and have gone 12 m. 3 f. 14 p., how far have I still to go?

4. Find the difference between 1 cwt. 2 qrs. 18 lbs. and 5 qrs. 22 lbs.

5. How much time elapses between 21 min. past 5 o'clock in the morning and noon?

6. A man rows at the rate of 5 m. 3 f. 17 p. an hour down a river which runs 1 m. 23 p. an hour; how fast could he row in still water?

7. An estate of 200 acres contains a piece of water which measures 13 a. 2 r. 12 p.; how much dry land is there?

8. A chest of tea weighs 1 cwt. 3 qrs. 12 lbs.; what is the *net* weight of the tea if the chest weigh 15 lbs. 13 oz.?

9. If a hogshead of sugar weigh 8 cwt. 3 qrs. 21 lbs. and the hogshead itself weigh 3 qrs. 23 lbs., find the net weight of the sugar.

MULTIPLICATION.

Example.—(1.) Multiply 15 t. 14 cwt. 3 qrs. by 9.

Beginning with the qrs. we have 9 times 3 qrs. are 27 qrs. or 6 cwt. 3 qrs.; the 3 qrs. is put down, and the 6 cwt. carried on. 9 times 14 cwt. is 126 cwt., which, with 6 cwt. carried, gives 132 cwt., or 6 t. 12 cwt., of which the 12 cwt. is put down, and the 6 t. carried on to the tons, making, with 9 times 15 t., a total of 141 t.

t.	cwt.	qrs.
15	14	3
		9
141	12	3

Example.—(2.) Multiply 43 a. 2 r. 23 p. by 238.

a.	r.	p.			
53	2	23			
		10			
536	1	30			
		10			
5364	1	20			
		2			
10728	3	0	= 200	times 53 a. 2 r. 23 p.	
1609	1	10	= 30	„	„
429	0	24	= 8	„	„
12767	0	34	= 238	„	„

Examples like this may often be worked shorter by the method given on p. 96 for money.

162. Long Measure.

1. 53 m. 7 f. 31 p. × 7.
2. 32 m. 1 f. 15 p. × 9.
3. 16 yds. 2 f. 11 in. × 5.
4. 25 yds. 7 in. × 12.
5. 3 m. 2 f. 21 p. × 84.
6. 45 m. 1 f. 13 p. × 63.
7. 6 yds. 5 in. × 16.
8. 2 ft. 10 in. × 36.

163. Cloth Measure.

1. 32 yds. 1 qr. 3 n. × 10.
2. 7 yds. 3 qrs. 2 n. × 6.
3. 60 yds. 1 n. × 4.
4. 15 yds. 2 qrs. 2 n. × 49.
5. 13 yds. 3 qrs. 1 n. × 96.
6. 182 yds. 2 n. × 99.

164. Avoirdupois Weight.

1. 5 t. 17 cwt. 2 qrs. × 3.
2. 61 t. 3 cwt. 3 qrs. 10 lbs. × 8.
3. 17 cwt. 1 qr. 22 lbs. × 11.
4. 10 cwt. 27 lbs. × 9.
5. 1 t. 9 cwt. 13 lbs. × 83.
6. 22 t. 5 cwt. 1 qr. 2 lbs. × 113.
7. 14 cwt. 3 qrs. 19 lbs. × 97.
8. 18 cwt. 1 qr. 20 lbs. × 73.

165. Troy Weight.

1. 6 lbs. 7 oz. 3 dwts. × 7.
2. 3 oz. 5 dwt. 20 grs. × 5.
3. 9 oz. 13 grs. × 10.
4. 3 lbs. 1 oz. 15 dwts. 23 grs. × 8.
5. 4 lbs. 10 oz. 3 grs. × 153.
6. 21 lbs. 15 dwts. × 254.
7. 7 oz. 5 dwts. 17 grs. × 304.
8. 2 lbs. 10 dwts. 4 grs. × 316.

166. Apothecaries' Weight.

1. 4 lbs. 3 oz. 4 drs. × 6.
2. 7 oz. 1 dr. 2 sc. 11 grs. × 4.
3. 2 lbs. 6 drs. 1 sc. × 12.
4. 5 oz. 3 drs. 18 grs. × 3.
5. 13 lbs. 10 oz. 5 drs. × 420.
6. 8 oz. 2 drs. 1 sc. 7 grs. × 517.
7. 10 lbs. 3 oz. 7 drs. 1 sc. × 163.
8. 4 lbs. 3 drs. 12 grs. × 327.

167. Superficial Measure.

1. 23 a. 2 r. 23 p. × 65.
2. 42 a. 3 r. 17 p. × 71.
3. 4 yds. 8 ft. 72 in. × 89.
4. 3 yds. 125 in. × 41.
5. 2 a. 3 r. 10 p. × 1724.
6. 2 a. 1 r. 13 p. × 3561.
7. 1 yd. 5 ft. 52 in. × 7030.
8. 3 yds. 6 ft. 100 in. × 3201.

168. Solid Measure.

1. 6 yds. 17 ft. 325 in. × 372.
2. 1 yd. 24 ft. 63 in. × 503.
3. 20 ft. 138 in. × 761.
4. 50 yds. 3 ft. 200 in. × 3005.
5. 7 yds. 1362 in. × 7130.
6. 25 ft. 1031 in. × 6035.

169. Time.

1. 5 d. 6 h. 21 m. × 24.
2. 2 d. 3 h. 5 m. 41 s. × 27.
3. 21 h. 53 m. 39 s. × 72.
4. 4 w. 6 d. 13 h. 5 m. × 81.
5. 3 h. 14 m. 23 s. × 91.
6. 2 d. 22 h. 17 m. 8 s. × 103.
7. 20 h. 43 m. 51 s. × 237.
8. 8 h. 37 s. × 414.

170. Dry Measure.

1. 5 qrs. 7 bush. 3 pks. × 120.
2. 3 bush. 2 pks. 1 gal. × 160.
3. 4 bush. 3 qrts. 1 pt. × 320.
4. 1 pk. 1 gal. 2 qrts. 1 pt. × 560.
5. 34 qrs. 2 bush. 2 pks. × 762.
6. 1 gal. 3 qrts. 1 pt. × 275.
7. 23 qrs. 6 bush. 3 pks. × 937.
8. 15 qrs. 2 pks. 1 gal. 2 qrts. × 634.

171. Liquid Measure.

1. 41 gals. 2 qrts. 1 pt. × 37.
2. 52 gals. 2 qrts. × 87.
3. 9 gals. 3 qrts. 1 pt. 2 gills × 93.
4. 30 gals. 1 pt. 3 gills × 57.
5. 41 gals. 2 qrts. 2 gills × 708.
6. 2 gals. 1 pt. 3 gills × 346.
7. 50 gals. 1 qrt. 2 gills × 835.
8. 17 gals. 3 gills × 921.

172.

1. A coal train consists of 17 trucks, each carrying 7 t. 3 cwt. 2 qrs. of coal; how much coal is there on the whole train?

2. If a train travel at the rate of 39 m. 7 f. 27 p. in an hour, how far will it run in 7 hours?

3. How much cloth is there in 24 pieces, each measuring 25 yds. 3 qrs. 2 n.

4. If a sovereign weighs 5 dwts. 3 grs., how much will 100 weigh?

5. If a watch gain 1 m. 13 s. in a day, how much will it gain in a fortnight?

6. How much silver will be required to make five dozen forks, each weighing 2 oz. 22 grs.?

7. If I sleep on an average 7 h. 20 m. every night, how much time do I spend in sleep in a year of 365 days?

8. If a man eat 6 oz. 5 drs. of meat in a day, how much will he eat in 96 days? How much will be required to supply 50 men for one week?

9. Find the area of a yard which requires 156 paving stones to cover it, each stone measuring 5 sq. ft. 131 sq. in.?

10. If a cart holds 2 cub. yds. 3 cub. ft. of earth, how much can be removed in it from one place to another in a week of 6 days if it makes 12 journeys a day?

11. If a man can mow 1 a. 36 p. of grass in a day, how much will 13 men mow in 5 days?

SHORT DIVISION.

Example.—Divide 131 lbs. 8 oz. 19 dwts. by 7.

Beginning with the pounds, we divide 131 by 7, which gives 18 and remainder 5; the 18 is put down, the 5 lbs. over converted to ounces and added to the 8 oz., giving 68 oz. Dividing 68 oz. by 7 we have 9 oz. and 5 over. The 5 oz. brought to dwts. gives, with the 19 dwts., 119 dwts., dividing which by 7 we get 17.

	lbs.	oz.	dwts.
7)	131	8	19
	18	9	17

173. Long Measure.

1. 35 m. 6 f. 38 p. ÷ 6.	*4.* 17 yds. 2 ft. 6 in. ÷ 3.
2. 96 m. 6 f. 8 p. ÷ 8.	*5.* 215 yds. 2 ft. ÷ 12.
3. 489 m. 4 f. 5 p. ÷ 9.	*6.* 325 yds. 2 ft. 6 in. ÷ 10.

174. Cloth Measure.

1. 79 yds. 1 qr. 2 n. ÷ 5.	*4.* 1388 yds. 2 qrs. ÷ 8.
2. 862 yds. 3 qr. 1 n. ÷ 11.	*5.* 5726 yds. 3 qrs. 2 n. ÷ 11.
3. 226 yds. 2 qr. 2 n. ÷ 7.	*6.* 3714 yds. 3 qrs. ÷ 12.

175. Avoirdupois Weight.

1. 50 t. 19 cwt. 1 qr. ÷ 9.
2. 52 t. 2 cwt. 12 lbs. ÷ 4.
3. 6 t. 5 cwt. 2 qrs. 7 lbs. ÷ 7.
4. 317 t. 9 cwt. 1 qr. 22 lbs ÷ 6.
5. 259 lbs. 13 oz. 8 drs. ÷ 10.
6. 4 cwt. 7 oz. ÷ 5.

176. Troy Weight.

1. 91 lbs. 8 oz. 2 dwts. ÷ 6.
2. 167 lbs. 7 oz. ÷ 4.
3. 3 lbs. 11 oz. 2 dwts. 16 grs. ÷ 7.
4. 520 lbs. 3 oz. 9 grs. ÷ 9.
5. 702 lbs. 4 oz. 16 dwts. 9 grs. ÷ 11.
6. 109 lbs. 1 oz. 18 dwts. ÷ 8.

177. Apothecaries' Weight.

1. 7 oz. 5 drs. 10 grs. ÷ 5.
2. 42 lbs. 7 oz. 2 drs. 2 sc. ÷ 8.
3. 50 lbs. 8 oz. 1 dr. ÷ 3.
4. 374 lbs. 6 oz. 1 dr. 1 sc. ÷ 10.
5. 2 lbs. 3 oz. 7 drs. 2 sc. 17 grs. ÷ 7.
6. 467 lbs. 9 oz. ÷ 12.

178. Superficial Measure.

1. 338 a. 1 r. 35 p. ÷ 5.
2. 2151 a. 1 r. 25 p. ÷ 7.
3. 3353 a. 2 r. 32 p. ÷ 8.
4. 449 yds. 7 ft. 96 in. ÷ 6.
5. 748 yds. 8 ft. 18 in. ÷ 9.
6. 8308 yds. 3 ft. 24 in. ÷ 12.

179. Cubic Measure.

1. 220 yds. 12 ft. 352 in. ÷ 3.
2. 3239 yds. 24 ft. 576 in. ÷ 4.
3. 329 yds. 23 ft. 681 in. ÷ 7.
4. 8349 yds. 14 ft. 904 in. ÷ 10.
5. 275 yds. ÷ 2.
6. 6945 yds. 25 ft. 1572 in. ÷ 11.

180. Dry Measure.

1. 434 qrs. 6 bush. 3 pks. ÷ 5.
2. 282 qrs. 6 bush. 2 pks. ÷ 4.
3. 7 qrs. 7 bush. 3 pks. ÷ 8.
4. 4 bush. 1 pk. 1 pt. ÷ 7.
5. 6 bush. 3 pks. 1 gal. 2 qrts. ÷ 12.
6. 357 qrs. 2 bush. 3 pks. ÷ 10.

181. Time.

1. 7 w. 1 d. 4 h. 8 m. ÷ 8.
2. 23 w. 2 d. 11 h. 15 m. ÷ 9.
3. 28 w. 6 d. 14 h. ÷ 8.
4. 3 d. 46 m. 50 s. ÷ 5.
5. 1 w. 4 d. 23 h. 39 m. ÷ 12.
6. 4 d. 12 h. 40 m. 30 s. ÷ 7.

182.

1. A man has to take on foot a journey of 128 m. 5 f. in 6 days, how far must he walk a day on the average?

2. If a dozen bottles of wine contain 2 gals. 1 qrt., how much is there in one bottle?

3. If ten men mow a field of 4 a. 3 r. 30 p. in a day, how much does each man mow on the average?

4. 3 lbs. 14 oz. of tea is to be divided equally among 8 old women, how much will each receive?

5. If 17 yds. 1 qr. of linen cost 6 shillings, how much can be bought for 1 shilling?

6. A silversmith makes 1 dozen spoons out of 2 lbs. 7 oz. 10 dwts. of silver, how much does one spoon weigh?

7. A railway train runs 141 m. 6 f. in 4 hours; what is its speed per hour?

8. A packet of lolipops weighing 1 lb. 4 oz. 10 drs. is to be divided equally among 11 children; how much should each receive?

9. If 1 quarter of malt will brew 109 gallons of beer, how much can be brewed from one bushel?

10. Six people join in buying a truck-load of coals weighing 10 t. 1 cwt.; what will be the share of each?

LONG DIVISION.

Example.—Divide 253 d. 0 h. 12 m. by 97.

d.	h.	m.	d.	h.	m.
97)253	0	12	(2	14	36
194					
59					
24					
236					
118					
1416 h.					
97					
446					
388					
58					
60					
3492 m.					
291					
582					
582					

Dividing first the days we have the quotient 2 and remainder 59, which is reduced to hours by multiplying by 24. The result, viz. 1416 h., is divided by 97, giving quotient 14 h. and remainder 58 h. The remainder 58 h. is brought to minutes and the 12 m. added, which gives 3492 m. This is divided by 97, giving the quotient 36 m.

183. Long Measure.

1. 311 m. 2 f. 21 p. ÷ 17.
2. 936 m. 2 f. 5 p. ÷ 23.
3. 2659 m. 3 f. 18 p. ÷ 34.
4. 1354 yds. 1 ft. 8 in. ÷ 73.
5. 1238 yds. 6 in. ÷ 51.
6. 2198 yds. 1 ft. 3 in. ÷ 31.

184. Avoirdupois Weight.

1. 5692 t. 13 cwt. 3 qrs. ÷ 97.
2. 8961 t. 19 cwt. 2 qrs. ÷ 102.
3. 8764 t. 14 cwt. 2 qrs. ÷ 138.

4. 1774 t. 17 cwt. 1 qr. ÷ 214.
5. 228 t. 6 cwt. 1 qr. 17 lbs. ÷ 302.
6. 156 t. 6 cwt. 3 qrs. 21 lbs. ÷ 357.

185. Troy Weight.

1. 4483 lbs. 3 oz. 4 dwts. ÷ 208.
2. 13920 lbs. 10 oz. 8 dwts. ÷ 451.
3. 31287 lbs. 8 oz. ÷ 530.
4. 26722 lbs. 6 oz. 3 dwts. ÷ 612.
5. 54109 lbs. 1 oz. 18 dwts. 12 grs. ÷ 671.
6. 73162 lbs. 8 oz. 2 dwts. 6 grs. ÷ 538.

186. Apothecaries' Weight.

1. 1851 lbs. 8 oz. 7 drs. ÷ 131.
2. 31648 lbs. 3 oz. 2 drs. 2 sc. ÷ 158.
3. 54804 lbs. 11 oz. 4 drs. ÷ 173.
4. 71612 lbs. 5 oz. 6 drs. ÷ 98.
5. 42786 lbs. 1 oz. 2 drs. ÷ 264.
6. 76593 lbs. 8 oz. 2 drs. ÷ 396.

187. Superficial Measure.

1. 18068 a. 3 r. 19 p. ÷ 307.
2. 49071 a. 3 r. 35 p. ÷ 73.
3. 23424 a. 1 r. 20 p. ÷ 130.
4. 1825 a. 2 r. 3 p. ÷ 1837.
5. 2346 yds. 3 ft. 2 in. ÷ 610.
6. 1071 yds. 68 in. ÷ 68.

188. Solid Measure.

1. 13080 yds. 15 ft ÷ 831.
2. 1152 yds. 23 ft. 120 in. ÷ 29.
3. 18104 yds. 22 ft. 145 in. ÷ 31.
4. 108324 yds. 4 ft. 704 in. ÷ 170.
5. 255647 yds. 22 ft. 1552 in. ÷ 850.
6. 51086 yds. 16 ft. 1719 in. ÷ 387.

189. Liquid Measure.

1. 168 gals. 2 qrts. 1 pt. ÷ 19.
2. 70 gals. 2 qrts. 1 pt. ÷ 113.
3. 19074 gal. 3 qrts. ÷ 232.
4. 8927 gals. 2 qrts. 3 pts. ÷ 86.
5. 8256 gals. 1 qrt. 1 pt. ÷ 164.
6. 2579 gals. 1 qrt. 3 gills. ÷ 3057.

190. Time.

1. 480 d. 6 h. 3 m. ÷ 29.
2. 758 d. 13 h. 10 m. ÷ 76.
3. 165 d. 15 h. 46 m. ÷ 231.
4. 2545 d. 7 h. 4 m. 41 s. ÷ 59.
5. 796 d. 6 h. 43 m. 40 s. ÷ 836.
6. 303 d. 13 h. 40 m. ÷ 7300.

191.

1. A war steamer burns 45 t. 6 cwt. of coals in 24 hours; how much is consumed per hour?

2. If a steamer make a journey of 823 m. 6 f. in 80 hours, what is her speed per hour?

3. The wheel of a carriage makes 732 revolutions in travelling a distance of 2175 yds. 2 ft.; what is its circumference?

4. A regiment of 832 soldiers weighs 64 t. 4 cwt. 2 qrs. 8 lbs.; what is their average weight per man?

5. If a clock gain half-an-hour in 25 days, how much does it gain a day? how much an hour?

6. 31 lbs. 11 oz. of cake was consumed at a school feast by 104 children; how much on an average did each child get?

7. If 1000 pills weigh 2 lbs. 3 oz. 2 sc., how much much does one weigh?

8. If 38 buckets of water just fill a cistern holding 83 gals. 1 pt., find how much a bucket holds.

9. A chain of 224 links weighs 3 cwt. 2 qrs. 14 lbs. how much does each link weigh?

10. Find the length of an iron rail if 288 placed end to end just reach a mile.

DIVISION BY CONCRETE DIVISOR.

Example.—How often is 4 cwt. 3 qrs. 17 lbs. contained in 8 t. 16 cwt. 1 qr. 24 lbs.?

Both divisor and dividend must first be reduced to the same denomination, viz. lbs.; the divisor is 549 lbs., the dividend 19764 lbs.; then 19764 is divided by 549, giving the quotient 36.

cwts.	qrs.	lbs.
4	3	17
4		
19		
28		
169		
38		
549 lbs.		

t.	cwts.	qr.	lbs.
8	16	1	24
	20		
	176		
	4		
	705		
	28		
	5664		
	1410		

549) 19764 lbs. (36
1647
3294
3294

192.

1. 60 m. 2 f. 32 p. ÷ 3 f. 22 p.
2. 73 yds. 1 ft. 1 in. ÷ 3 yds. 2 ft. 7 in.
3. 114 m. 3 f. 39 p. ÷ 12 m. 5 f. 31 p.
4. 662 yds. 3 qrs. 1 n. ÷ 18 yds. 3 qrs. 3 n.
5. 250 t. 17 cwt. ÷ 14 cwt. 2 qrs.
6. 5137 t. 1 cwt. 1 qr. 20 lbs. ÷ 7 t. 1 qr. 12 lbs.
7. 98 t. 17 cwt. 1 qr. 20 lbs. ÷ 2 qrs. 16 lbs.
8. 96 lbs. 9 dwts. ÷ 5 oz. 17 dwts.
9. 103 lbs. 11 oz. ÷ 17 dwts. 22 grs.
10. 323 lbs. 5 oz. 2 drs. ÷ 5 oz. 7 drs. 2 sc. 15 grs.
11. 1221 lbs. 3 oz. 6 drs. 2 sc. ÷ 2 lbs. 10 oz. 2 sc.
12. 1825 a. 2 r. 3 p. ÷ 3 r. 39 p.
13. 731 a. 1 r. 35 p. ÷ 8 a. 35 p.

14. 1071 sq. yds. 68 sq. in. ÷ 15 sq. yds. 6 sq. ft. 109 sq. in.
15. 13080 cub. yds. 15 cub. ft. ÷ 15 cub. yds. 20 cub. ft.
16. 204 gals. 1 pt. ÷ 8 gals. 3 qrts. 1 pt.
17. 25961 gals. 1 qrt. ÷ 6 gals. 2 qrts. 1 pt. 3 gills.
18. 303 d. 13 h. 40 m. ÷ 59 m. 48 s.
19. 165 d. 15 h. 46 m. ÷ 17 h. 12 m. 40 s.
20. 118 d. 21 h. 27 m. 18 s. ÷ 31 m. 54 s.

193.

1. The wheel of a carriage measures 8 ft. 3 in. round; how many revolutions does it make in travelling 10 m.?

2. How many doses of 20 minims are contained in a 2 oz. bottle of medicine?

3. If a watch gain 2 m. 24 s. a day, in how many days will it gain 36 m.?

4. How many pieces of paper measuring 10 sq. yds. 5 sq. ft. will be required to paper a room whose walls measure 126 sq. yds. 6 sq. ft.?

5. If a steamer go at the rate of 9 m. 5 f. 16 p. per hour, how long will she take to make a journey of 222 m. 4 f. 8 p.?

6. How many tiles, each measuring 23 sq. in. will be required to pave a floor of 89 sq. ft. 87 sq. in.?

7. How many bottles, each containing 1 qrt. 3 gills, can be filled from a cask which holds 57 gals. 3 qrts.?

8. How many times in succession can 5 oz. 17 dwts. 21 grs. be subtracted from 20 lbs., and what will be the remainder?

9. A field containing 17 a. is divided into building lots, each measuring 35 p.; how many of these will there be, and how much land will be left over?

10. A cistern which holds 812 gals. 1 qrt. is filled by a pipe at the rate of 3 gals. 2 qts. 2 gills per minute, in how many minutes will it be full?

HARDER EXAMPLES OF THE FOUR RULES.

It has been deemed advisable to place by themselves examples in the four rules which involve both poles and yards, nails and inches, or square poles and square yards, and which therefore require the use of the multipliers $5\frac{1}{2}$, $2\frac{1}{4}$, $30\frac{1}{4}$, to effect the reductions.

ADDITION.

Example.—Proceeding with the addition in the usual way, we obtain on adding the yards, 10 yards, that is, 1 pole and $4\frac{1}{2}$ yards; instead of writing $4\frac{1}{2}$ in the yards place, write the 4 yds. only, and put down the $\frac{1}{2}$ yd. as 1 ft. 6 in. under the feet and inches; afterwards add this to the first line, and we have as our final result 11 p. 5 yds. 5 in.

p.	yds.	ft.	in.
3	4	1	6
5	3	2	7
2	1	3	10
11	4	1	11
		1	6
11	5	0	5

SUBTRACTION.

Most questions in subtraction can be worked in the same manner as the addition sum given above, thus—

Subtract 5 p. 3 yds. 2 ft. from 8 p. 2 yds. 1 ft.

In subtracting the yards we have to take 4 yds. from $7\frac{1}{2}$ yds., leaving $3\frac{1}{2}$ yds., which we write as 3 yds. 1 ft. 6 in.

p.	yds.	ft.	
8	2	1	
5	3	2	
2	3	2	in.
		1	6
2	4	0	6

Some questions, however, cannot be done by the ordinary methods, as will be clear if the following be attempted.

Subtract 6 p. 5 yds. 1 ft. from 7 p.

This question will be best worked by reducing the poles to yards., ft., and in., thus—

6 p. = 66 half-yards = 33 yds.
Therefore 6 p. 5 yds. 1 ft. = 38 yds. 1 ft.
7 p. = 77 half-yards = 38 yds. 1 ft. 6 in.

The sum now will be

yds.	ft.	in.
38	1	6
38	1	0
		6 in.

MULTIPLICATION.

The same method applies as for addition.

Example.—Multiply 4 p. 5 sq. yds. 6 sq. ft. 81 sq. in. by 7.

	p.	sq. yds.	sq. ft.	sq. in.
	4	5	6	81
				7
	29	9	0	135
			6	108
	29	9	7	99

In multiplying the yards we have 40 yds., or, since $30\frac{1}{4}$ sq. yds. make a pole, 1 pole $9\frac{3}{4}$ sq. yds., of which we put down the 9 under the yards, and the $\frac{3}{4}$ yd. which is the same as 6 ft. 108 in., we write under the ft. and in., and add in at the end of the sum.

To find the value of three-quarters of a yard in the above sum we may proceed thus :—One quarter of a square yard is 2 ft. 36 in., therefore three-quarters of a yard is 2 ft. 36 in. × 3, or 6 ft. 108 in.

DIVISION.

Divide 20 p. 20 sq. yds. 7 sq. ft. 36 sq. in. by 13.

We have a remainder of 7 p. from the poles ; this is brought to quarter-yards by multiplying by 121, and these to yards by dividing by 4 (there are $30\frac{1}{4}$ yds. or 121 quarter-yards in a pole) ; we thus obtain 211 yds. and three-quarters, or 6 ft. 108 in.; adding to this the 20 yds. 7 ft. 36 in. of the original sum, we get for the complete remainder at this stage 232 yds. 5 ft., which, divided by 13, in the usual manner, gives a quotient of 17 yds. 8 ft. The complete answer is therefore 1 p. 17 yds. 8 ft.

p.	sq. yds.	sq. ft.	sq. in.	p.	sq. yds.	sq. ft.
13)20	20	7	36	(1	17	8
13						
7 poles.						
121						
4)847 quarter-yards.						
211 yds. 6 ft. 108 in.						
20	7	36				
232	5					
13						
102						
91						
11						
9						
104 feet.						
104						

194. Addition.

Add together—

1. 15 p. 4 yds. 1 ft. 6 in.; 33 p. 3 yds. 2 ft.; 17 p. 2 yds. 2 ft. 8 in.; 6 p. 1 ft. 9 in.; 10 p. 8 in.

2. 31 p. 2 yds. 2 ft. 4 in.; 5 p. 1 yd. 8 in.; 11 p. 2 ft. 11 in.; 9 p. 1 yd. 1 ft. 9 in.

3. 5 yds. 3 qrs. 3 n. 2 in.; 6 yds. 1 qr. 1 n. $1\frac{1}{4}$ in.; 3 yds. 2 n. 2 in.; 8 yds. 2 qrs. 3 n. $1\frac{3}{4}$ in.

4. 10 yds. 2 qrs. 3 n. 1 in.; 12 yds. 2 n. $1\frac{1}{2}$ in.; 5 yds. 3 qrs.; 3 qrs. 3 n. $1\frac{3}{4}$ in.

5. 4 a. 3 r. 21 p. 4 yds.; 8 a. 19 p. 1 yd.; 10 a. 3 r. 12 p. 3 yds.; 21 a. 1 r. 21 p. 3 yds.

6. 15 p. 4 yds. 2 ft. 3 in.; 5 p. 2 yds. 1 ft. 10 in.; 4 yds. 11 in.; 3 p. 5 yds. 1 ft. 3 in.; 1 yd. 2 ft. 10 in.

195. Subtraction.

1. 15 p. 3 yds. 2 ft. 6 in. – 3 p. 4 yds. 1 ft. 10 in.

2. 8 p. 2 yds. 1 ft. 10 in. – 5 p. 4 yds. 2 ft. 8 in.

3. 6 a. 3 r. 21 p. 22 yds. 3 ft. 16 in. – 2 a. 1 r. 13 p. 27 yds. 1 ft. 10 in.

4. 33 p. 12 yds. 8 ft. 100 in. – 27 p. 9 yds. 8 ft. 123 in.

5. 83 yds. 2 qrs. 3 n. 1 in. – 48 yds. 3 qrs. 3 n. 2 in.

6. 68 yds. – 43 yds. 1 qr. 2 n. $1\frac{3}{4}$ in.

196. Multiplication.

1. 3 f. 21 p. 3 yds. 2 ft. 6 in. × 9.
2. 14 m. 5 f. 32 p. 1 yd. 3 in. × 24.
3. 15 yds. 3 qrs. 1 n. 2 in. × 38.
4. 27 yds. 1 qr. 3 n. $1\frac{1}{2}$ in. × 15.
5. 5 a. 2 r. 25 p. 25 yds. 3 ft. 26 in. × 100.
6. 18 a. 3 r. 17 p. 28 yds. 1 ft. 135 in. × 237.

197. Division.

1. 1 f. 13 p. 4 yds. 1 ft. 6 in. ÷ 6.
2. 2 f. 29 p. 3 yds. 6 in. ÷ 8.
3. 829 yds. 1 qr. 2 in. ÷ 10.
4. 372 yds. 2 qrs. 1 n. $1\frac{1}{2}$ in. ÷ 7.
5. 57 a. 1 r. 19 p. 28 yds. 2 ft. 36 in. ÷ 12.
6. 3 a. 3 r. 38 p. 29 yds. 7 ft. 72 in. ÷ 76.
7. 7 m. 2 f. 38 p. ÷ 132.
8. 11100 yds. 1 qr. 1 n. $1\frac{1}{4}$ in. ÷ 350.

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198. MISCELLANEOUS EXAMPLES.

1. From a piece of cloth which measured 42 yds. 3 qrs. 1 n. a draper has sold to one customer 2 yds. 1 qr., to another 5 yds. 3 n., to a third 10 yds. 3 qrs.; how much remains?

2. How many half-pints of beer can be drawn from an 18 gal. cask, allowing 1 gal. 1 pt. for waste?

3. Reduce 1 stone avoirdupois to Troy weight.

4. Find the length in miles, &c., of a road which measures 1032 chains.

5. A farm consists of ten fields, two of which contain 10 a. 3 r. 12 p. each, three contain 8 a. 30 p. each, 4 contain 5 a. 1 r. 14 p. each, and the remaining one contains 24 a. 2 r. 27 p.; what is the size of the farm?

6. If a man take 110 steps, each 30 in. long, in a minute, how far will he walk in an hour?

7. A cubic foot of water weighs 1000 oz.; what weight of water will a vessel contain which holds 37 cub. ft.

8. Out of a cask of sugar which contained 4 cwt. a grocer has sold 84 two-pound packets, 168 one-pound packets, and 100 half-pound packets; how much is still left in the cask?

9. The floor and ceiling of a square room each measure

23 sq. yds. 5 sq. ft. 76 sq. in., and each wall measures 15 sq. yds. 123 sq. in.; find the whole area of the surface of the room.

10. A gallon of water weighs 10 lbs.; find the weight of a 63 gal. cask full of water if the empty cask weigh 2 cwt. 1 qr. 10 lbs.

11. How many square inches are there in an acre?

12. Three pigs were killed, of which the first weighs 17 stone 5 lbs., the second 22 stone 7 lbs, and the third 15 stone 9 lbs.; what was their average weight?

13. A cistern holds 100 gallons of water; if 56 gals. 2 qrts. 1 pt. be put in and then 18 gals. 1 qrt. be taken out, how much more will it still hold?

14. Find the weight of 8000 copies of a book of which the paper weighs 5 oz. 13 drs. and the binding 1 oz. 7 drs.

15. If three grains of barley placed end to end measure one inch, how many would be required to reach a mile?

16. If a brick contain 108 cubic inches, find the solid contents of a wall which contains 1397 bricks, allowing 7 cub. ft. 532 cub. in. for mortar?

17. An angler caught two fish weighing a pound and a half each, four weighing one pound one ounce each, and thirteen more averaging a quarter of a pound each; what weight of fish did he carry home?

18. A man can row at the rate of 5 miles an hour in still water; if he rows for an hour down stream and then for an hour up stream in a river flowing at the rate of 1 m. 2 f. 13 p. an hour, how far will he then be from his starting-place?

19. If one ox weigh as much as 7 sheep, and 10 sheep weigh 13 cwt. 3 qrs., find the weight of 7 oxen?

20. A cistern holding 199 gals. 3 qrts. is filled by two pipes, one of which delivers 3 gals. 2 qrts. 1 pt. per minute, the other 8 gals. 1 pt.; in how many minutes will it be filled?

21. If it is 2 f. 26 p. from your home to school, and you come to school twice a-day on Monday, Tuesday, Thursday, and Friday, and once a-day on Wednesday and Saturday, how far do you thus walk in 8 weeks?

22. The four sides of a field are 21 p. 2 yds.; 17 p. 3 yds. 1 ft. 6 in.; 15 p. 4 yds.; 16 p. 1 yd. 6 in.; how far shall I walk if I go four times round the field?

23. How much time elapses between 13 minutes past 10 on Monday morning and 23 minutes to eight on Saturday evening?

24. Find in grains the difference between 1 lb. Troy and 1 lb. avoirdupois.

25. How many chains are there in 12 m. 2 f. 8 p.?

26. A dishonest milkman mixes a pint of water with every gallon of pure milk; out of 15 gallons of milk how much mixture will he make?

27. In England there are 50535 square miles, in Scotland 29167 square miles; how many more acres are there in England than Scotland?

28. By the side of a railway are 17 telegraph wires; find the whole length of wire between two stations 13 m. 5 f. apart.

29. The extremities of the sails of a windmill move in a circle whose circumference is 31 ft., how far do they travel in an hour if they make one revolution in 4 seconds?

30. A grain of wheat weighs 1 gr.; how many will be required to make 1 cwt. of flour, allowing 15 lbs. for waste?

31. 103 beads may be strung on a thread 7 inches long; how many will be required for a thread 14 yards long, and what will they weigh if each bead weigh half-a-grain?

32. I have 13 crowns, 12 half-crowns, 23 florins, 35 shillings, and 50 fourpenny pieces; how much money have I altogether?

33. The fore wheel of a bicycle is 16 ft. in circumference and the hind wheel 5 ft.; how many more revolutions will the hind wheel make than the fore wheel in a journey of 25 miles?

34. How many times does a clock tick in a week which ticks 5 times in 2 seconds?

35. A field is 340 yds. long and 123 yds. wide; find the length of the hedge which encloses it.

36. I have £3 15*s.* 7*d.*; how much more shall I require to enable me to give each of 14 men 10*s.* 7½*d.*?

37. The lamp-posts along a road are 66 yds. apart; how many are there in a distance of 12 miles?

38. I wish to plant 199 trees in a row ¼ mile long; at what distance apart must they be placed, allowing one at each end of the row?

39. How many parcels of tea, each containing 3 lbs. 4 oz., are equivalent to 52 parcels, each containing 3 lbs. 7 oz.?

40. How much would 3 f. of rope cost at 4*d.* per yard?

41. How often can a bottle holding 1 gal. 1 pt. be filled from a cistern holding 72 gals.?

42. Find the cost of removing 6341 cu. yds. of soil at 8*d.* per yd.

43. A well is sunk at the rate of 1 foot per day; how long would it take to bore to the centre of the earth (4000 miles) at this rate?

44. A coal pit is 534 yds. deep; find the distance travelled ascending and descending in 6 days by a man who goes down once a-day?

45. What length of wire will be required to make one million pins each an inch and a-half long?

46. If 27 steel pens weigh 1 oz., what will be the weight of 32616?

47. From an 18-gallon cask of beer has been drawn

every day for a fortnight 2 qrts. 1 pt., and 1 gal. 3 qrts. has leaked; how much remains?

48. How many 8 oz. packets can be made from 1 ton of tea?

49. If to make my tea every evening I use three spoonsful of tea, and if five spoonsful make one ounce, how much tea shall I use in a year?

50. A silver fork weighs 14 dwts. 21 grs. and a spoon 15 dwts. 10 grs.; by how much will three dozen forks exceed in weight two dozen spoons?

51. Find the number of seconds between 20 minutes past 2 o'clock and 35 minutes past 5 on the same day.

52. Add together 1000 tons, 1000 cwt., 1000 qrs., and 1000 lbs.

53. 5225 oranges are bought at 5 for twopence, and 7324 apples at 4 a penny; find the value of the whole?

54. How many plots, each containing 400 sq. yds., can be made from 50 acres?

55. Three places, A, B, C, are on the same road; the distance from A to B is 23 m. 5 f. 14 p., and from B to C the distance is 2 m. 7 f. 3 p. longer than from A to B; find the distance from A to C.

56. How many more grains are there in 100 lbs. avoirdupois than in 100 lbs. troy?

57. A man dies at the age of 64 years; how many hours has he lived?

58. A reel of cotton contains 125 yds.; how many would be required to reach round the earth, a distance of twenty-five thousand miles?

59. The sun is ninety-two millions of miles from the earth; how long would it take to reach it if one could travel at the rate of one thousand miles a minute?

60. How many bullets, each weighing 10 dwts. 5 grs., can be made from one ton of lead?

61. Divide 1 t. 8 cwt. of coal between two men, giving one of them 3 qrs. more than the other.

62. If I walk 23 miles in 5 h. 53 m. 3 s., how long do I take to walk 1 mile, and how long to walk 13 miles?

63. During 6 weeks of the year I pay in wages to my men £1 10*s.* a week, and during the rest of the year £2 15*s.* 6*d.* a week; how much do I spend in wages in the year?

64. A steamship burns 1 t. 7 cwt. 3 qrs. of coal per hour; how much will be required for a voyage which lasts 13 days?

65. A man dies at the age of 36; he has slept 7 hours out of every 24: how many minutes has he been awake?

66. If 5 grs. of a drug will make one pill, how many can be made from 1 lb. 7 oz. 3 drs. 2 sc.?

67. One family burns 1 t. 11 cwt. of coal a week, another 17 cwt.; state how many quarters the first family burns in a year more than the second?

68. From a piece of cloth 73 yds. 3 qrs. long a draper sells to one customer 13 yds. 1 qr., to another 3 yds. 2 qrs., to a third 8 yds. 3 qrs., and to each of three others 4 yds. 2 qrs.; how much is left of the piece?

69. A man has 19 lbs. of coffee; he gives to each of 7 persons 1 lb. 12 oz.: how many drams has he left?

70. If a girl has on her head 35352 hairs, each of which is 2 ft. 7 in. long, how far would they reach if placed end to end?

71. 1 oz. of Gregory's powder is divided among ten children; one of them has 1 sc. 10 grs.; how much does each of the remaining 9 receive?

72. A dog eats two biscuits per day; how long will 1 cwt. 3 qrs. 14 lbs. last if 3 biscuits weigh one pound?

73. A man can mow 1 acre of hay in 8 hrs.; how many poles can he mow in 3 hrs.?

74. A pond covers 5 a. 2 r. 15 p., but in it are two

islands containing 2 r. 35 p., and 3 r. 13 p. respectively; what is the actual area of the water?

75. A brooch weighs 13 dwts. 17 grs.; it contains one stone weighing 1 dwt. 12 grs., and ten others each weighing 7 grs.; how much does the gold in which they are set weigh?

76. How much will 13 miles of string weigh if 55 yds. weigh 1 oz.?

77. A man drinks 3 pints of beer per day; how much does he drink in a year? If the beer cost 3*d.* per pint, how much money would he save in a year by drinking water instead?

78. A gallon of water weighs 10 lbs.; find the weight of a cask full of water if the cask when empty weighs 1 cwt. 13 lbs. and holds 120 gals.

ARITHMETIC.

PART III.

PRACTICE.

PRACTICE is a method of finding the price of any quantity when the price of one unit is given: it is divided into "simple" and "compound" practice, according as the quantity, the price of which is required, is an exact multiple of the unit whose price is given or not. The following is a question in "simple" practice:—"Find the price of 85 tons of coal at £1 8*s.* 6*d.* per ton." Had the quantity of coal in the above question been 85 tons 13 cwt. 3 qrs., and not an exact number of tons, we should have required the method of "compound" practice for its solution.

SIMPLE PRACTICE.

If to the price of say 132 articles at £3 each we add the price of 132 at 10*s.* each, and also the price at 4*s.* each, we shall have the price at £3 + 10*s.* + 4*s.* each, *i.e.*, at £3 14*s.* each. On this principle the method of practice depends, as will be clear from the following examples.

Example 1.—Find the price of 359 articles at 9*s.* 7½*d.* each.

		s.				
		359	= price at 1*s.*	each.		
		9				
		3231	„	9*s.*	„	
6*d.*	½	179	6*d.*	„	6*d.*	„
1*d.*	⅙	29	11*d.*	„	1*d.*	„
¼*d.*	¼	7	5¾*d.*	„	¼*d.*	„
	20)	3447	10¾*d.*	„	9*s.* 7¼*d.*	„
		£172	7*s.* 10¾*d.*			

The price in the above begins with shillings, so we start with the price at one *shilling* each. The price at 7¼*d.* is got by taking the price at 6*d.*, 1*d.*, and ¼*d.* For the price at 6*d.* we take one-half of the price at 1*s.* each, writing down 6*d.* – ½ at the side; the price at 1*d.* is one-sixth of the price at 6*d.*, so we put down 1*d.* – ⅙ at the side, and divide the last line by 6. In a similar manner, the price at ¼*d.* is one-fourth of the price at 1*d.* We finally add up all these partial prices, and reduce the shillings to pounds by dividing by 20.

Example 2.—Required the price of 97 articles at £3 17*s.* 9*d.* each.

		£				
		97	= price at £1 each.			
		3				
		291	„	£3		
10*s.*	½	48	10*s.*	„	10*s.*	
5*s.*	¼	24	5*s.*	„	5*s.*	
2*s.* 6*d.*	⅛	12	2*s.* 6*d.*	„	2*s.* 6*d.*	
3*d.*	1/10	1	4*s.* 3*d.*	„	3*d.*	
		£377	1*s.* 9d.		£3 17*s.* 9*d.*	

The price contains pounds, and we therefore start with the price of 97 at one *pound* each, and no reduction is required at the end.

Example 3.—Find the value of 745 things at £1 9*s.* 3*d* each.

		£				
		745		= value at £1 each.		
5*s.*	¼	186	5*s.*	,,	5*s.* each.	
4*s.*	⅕	149	0*s.*	,,	4*s.* ,,	
3*d.*	1/16	9	6*s.* 3*d.*	,,	3*d.* each.	
		£1089	11*s.* 3*d.*		£1 9*s.* 3*d.*	

In the above example both the price at 5*s.* and that at 4*s.* are obtained by dividing the top line or the price at £1 by 4 and 5 respectively.

It is generally best to start a practice sum with pounds, shillings, or pence, according as the price given begins pounds, shillings, or pence.

199.

1.	3046	at	7½*d.*
2.	5130	,,	6¼*d.*
3.	739	,,	3½*d.*
4.	98	,,	11¼*d.*
5.	2381	,,	6¾*d.*
6.	725	,,	2¾*d.*
7.	937	,,	10¾*d.*
8.	538	,,	8½*d.*
9.	9001	,,	9¾*d.*
10.	6300	,,	5¼*d.*

200.

			s.	*d.*
1.	53	at	3	6
2.	729	,,	7	4
3.	305	,,	8	3
4.	6121	,,	10	2
5.	732	,,	12	6
6.	637	,,	5	1½
7.	930	,,	6	1
8.	8131	,,	13	3
9.	1736	,,	17	4
10.	821	,,	15	1½

201.

			£	*s.*	*d.*
1.	89	at	3	10	0
2.	103	,,	5	5	0
3.	638	,,	7	4	0
4.	931	,,	2	2	6
5.	137	,,	3	3	4
6.	1396	at	10	6	8
7.	75	,,	3	2	0
8.	137	,,	4	2	6
9.	937	,,	1	5	0
10.	725	,,	2	1	8

202.

			s.	d.
1.	137	at	5	9
2.	305	„	8	8
3.	1539	„	12	7
4.	827	„	7	5
5.	356	„	14	9
6.	832	at	9	$1\frac{1}{4}$
7.	4015	„	18	7
8.	523	„	15	8
9.	7310	„	10	5
10.	1403	„	12	$1\frac{1}{4}$

203.

			£	s.	d.
1.	501	at	3	15	0
2.	438	„	2	6	0
3.	937	„	4	12	0
4.	1350	„	5	7	6
5.	837	„	2	12	6
6.	429	„	7	11	0
7.	8112	„	2	3	0
8.	538	„	8	15	0
9.	98	„	12	12	6
10.	143	„	9	7	6

204.

			s.	d.
1.	635	at	4	$8\frac{1}{2}$
2.	803	„	7	$9\frac{1}{2}$
3.	1734	„	5	$5\frac{1}{4}$
4.	380	„	12	$7\frac{1}{4}$
5.	423	„	2	$3\frac{3}{4}$
6.	821	„	8	$2\frac{3}{4}$
7.	930	„	13	$6\frac{3}{4}$
8.	143	„	15	$5\frac{1}{2}$
9.	4231	„	3	$8\frac{1}{4}$
10.	1503	„	17	$1\frac{3}{4}$

205.

			£	s.	d.
1.	521	at	1	7	6
2.	438	„	1	13	6
3.	573	„	1	17	6
4.	432	„	1	2	7
5.	713	„	1	5	6
6.	348	„	1	11	4
7.	1530	„	1	13	3
8.	639	„	1	8	0
9.	113	„	1	15	6
10.	3004	„	1	3	2

206.

			£	s.	d.
1.	58	at	3	9	0
2.	156	„	5	16	8
3.	3007	„	7	13	4
4.	4321	„	2	14	6
5.	521	„	8	19	0
6.	370	„	4	8	4
7.	1751	„	9	11	8
8.	638	„	4	16	8
9.	817	„	6	18	0
10.	5031	„	10	9	6

207.

			s.	d.				£	s.	d.
1.	931	at	7	$0\frac{1}{2}$	6.	3072	at	3	10	6
2.	435	„	12	$0\frac{3}{4}$	7.	431	„	5	4	3
3.	596	„	13	$4\frac{1}{4}$	8.	872	„	8	2	1
4.	8031	„	5	$6\frac{1}{4}$	9.	909	„	1	0	6
5.	721	„	15	$0\frac{1}{2}$	10.	837	„	2	10	4

208.

			£	s.	d.				£	s.	d.
1.	934	at	4	13	$8\frac{1}{2}$	11.	1367	at	1	8	$1\frac{3}{4}$
2.	527	„	7	6	$7\frac{1}{4}$	12.	7360	„		19	$7\frac{3}{4}$
3.	873	„	1	16	$10\frac{1}{2}$	13.	39	„	14	6	$0\frac{1}{2}$
4.	81	„	23	17	5	14.	185	„		17	$11\frac{3}{4}$
5.	53	„	41	18	$1\frac{1}{4}$	15.	938	„	2	16	$1\frac{1}{2}$
6.	623	„	5	7	$7\frac{3}{4}$	16.	7025	„	1	12	$10\frac{1}{4}$
7.	132	„	1	12	$0\frac{1}{2}$	17.	358	„		11	$11\frac{1}{2}$
8.	738	„	3	3	$0\frac{1}{4}$	18.	731	„	5	5	5
9.	839	„	12	15	$2\frac{1}{2}$	19.	600	„	3	7	$7\frac{1}{2}$
10.	703	„	14	13	$11\frac{1}{4}$	20.	1203	„		8	$8\frac{1}{4}$

COMPOUND PRACTICE.

Example 1.—Find the cost of 12 tons 15 cwt. of coal at £1 3*s.* 6*d.* per ton.

		£	s.	d.		
		1	3	6	= cost of 1 ton.	
				12		
		14	2	0	„	12 tons.
10 cwt.	$\frac{1}{2}$		11	9	„	10 cwt.
5 cwt.	$\frac{1}{4}$		5	$10\frac{1}{2}$	„	5 „
		£14	19	$7\frac{1}{2}$		12 tons 15 cwt.

We begin with the cost of 1 t. and multiply by 12 to find the cost of 12 t.; then since 10 cwt. is one-half of a ton, we

take half the top line for the price of 10 cwt., and in the same way, half the price of 10 cwt. gives the price of the remaining 5 cwt.

Example 2.—What is the value of 3 cwt. 2 qrs. 16 lbs. of sugar, at 7*s.* 3½*d.* per quarter?

Since 3 cwt. 2 qrs. = 14 qrs., we have to find the price of 14 qrs. 16 lbs. at 7*s.* 3½*d.* per quarter, and the question can be worked like the last, as below.

		£	s.	d.			
			7	3½	= price of 1 qr.		
				2			
			14	7	„	2 „	
				7			
		5	2	1		14 „	
14 lbs.	½		3	7½			14 lbs.
2 lbs.	⅛			0¾			2
		£5	6	3		14 qrs.	16 lbs.

Example 3.—Find the price of 3 cwt. 1 qr. 11 lbs. at £2 6*s.* 8*d.* per ton.

		£	s.	d.				
		2	6	8	= price of 1 ton.			
2 cwt.	1/10		4	8	„	2 cwt.		
1 cwt.	½		2	4	„	1 „		
1 qr.	¼			7	„		1 qr.	
7 lbs.	1/28			1¾	„			7 lbs.
4 lbs.	1/7			1	„			4 „
			7	9¾		3 cwt.	1 qr.	11 lbs.

In the above, both the price of 7 lbs. and that of 4 lbs. are got from 2*s.* 4*d.*, the price of 1 qr., by dividing it by 4 and 7 respectively.

209.

		£	s.	d.	
1.	15 t. 10 cwt.	at 3	4	3	per ton.
2.	8 t. 5 cwt.	„ 9	13	5	„ ton.
3.	7 cwt. 2 qrs.	„ 3	2	6	„ cwt.
4.	15 cwt. 1 qr.	„	14	5	„ cwt.
5.	3 qrs. 14 lbs.	„	17	2½	„ qr.

210.

		£	s.	d.	
1.	5 oz. 10 dwts.	at	12	2½	per oz.
2.	10 oz. 5 dwts.	„ 1	10	6	„ oz.
3.	8 dwts. 12 grs.	„ 3	2	3	„ dwt.
4.	12 dwts. 8 grs.	„ 1	5	1½	„ dwt.
5.	5 lbs. 4 oz.	„ 3	12	4½	„ lb.
6.	10 lbs. 2 oz.	„	17	3	„ lb.

211.

		£	s.	d.	
1.	3 oz. 4 drs.	at 2	17	3½	per oz.
2.	6 oz. 2 drs.	„	15	4	„ oz.
3.	5 drs. 1 sc.	„	7	10½	„ dr.
4.	2 sc. 5 grs.	„	3	5	„ sc.
5.	7 drs. 1 sc.	„ 1	15	6	„ dr.

212.

		£	s.	d.	
1.	7 yds. 1 ft.	at	5	10½	per yd.
2.	18 yds. 1 ft. 6 in.	„ 1	13	6	„ yd.
3.	3 yds. 2 qrs.	„	14	8½	„ yd.
4.	15 yds. 1 qr.	„ 1	3	9	„ yd.
5.	3 qrs. 1 n.	„	16	1	„ qr.
6.	7 ft. 4 in.	„	16	7½	„ ft.

213.

		£	s.	d.	
1.	8 gals. 2 qrts.	at	13	5	per gal.
2.	13 gals. 1 qrt.	„	5	7	„ gal.
3.	3 qrts. 1 pt.	„	3	10½	„ qrt.
4.	18 gals. 1 pt.	„ 1	17	2	„ gal.
5.	25 gals. 1 qrt.	„	18	11	„ gal.
6.	13 gals. 2 qrts.	„ 1	3	6½	„ gal.

214.

			£	s.	d.	
1.	5 t. 15 cwt.	at	7	16	3	per ton.
2.	6 cwt. 3 qrs.	„	1	3	8	„ cwt.
3.	3 qrs. 21 lbs.	„		19	10	„ qr.
4.	3 t. 3 cwt.	„	30	11	8	„ ton.
5.	7 cwt. 1 qr. 7 lbs.	„	1	10	8	„ cwt.
6.	9 t. 12 cwt.	„	21	15	5	„ ton.
7.	9 cwt. 1 qr. 14 lbs.	„	4	16	0	„ cwt.

215.

			£	s.	d.	
1.	8 oz. 15 dwts.	at		9	4	per oz.
2.	9 dwts. 14 grs.	„		11	0	„ dwt.
3.	7 lbs. 9 oz.	„	5	13	8	„ lb.
4.	4 lbs. 7 oz.	„		15	6	„ lb.
5.	10 oz. 6 dwt.	„	1	3	4	„ oz.

216.

			£	s.	d.	
1.	7 drs. 2 sc.	at		15	$7\frac{1}{2}$	per dr.
2.	5 oz. 1 dr. 1 sc.	„	2	17	6	„ oz.
3.	6 lbs. 7 oz.	„	3	0	9	„ lb.
4.	6 drs. 1 sc. 5 grs.	„	1	8	3	„ dr.
5.	12 lbs. 1 oz. 2 drs.	„	1	12	0	„ lb.

217.

			£	s.	d.	
1.	7 ft. 8 in.	at	1	4	6	per ft.
2.	21 ft. 5 in.	„		10	6	„ ft.
3.	4 yds. 1 ft. 4 in.	„		10	$11\frac{1}{2}$	„ yd.
4.	9 yds. 2 ft.	„	3	17	$6\frac{3}{4}$	„ yd.
5.	9 yds. 3 qrs.	„		10	11	„ yd.
6.	12 yds. 1 qr. 1 n.	„	2	17	0	„ yd.

218.

			£	s.	d.	
1.	12 gals. 3 qrts.	at	1	3	6	per gal.
2.	3 gals. 1 qrt. 1 pt.	„		15	4	„ gal.
3.	6 bush. 1 pk. 1 gal.	„	3	0	8	„ bush.
4.	5 qrs. 6 bush.	„	3	14	2	„ qr.
5.	12 qrs. 5 bush.	„	13	14	2	„ qr.

219.

			£	s.	d.	
1.	15 cwt. 3 qrs. 4 lbs.	at	12	5	0	per cwt.
2.	24 t. 11 cwt. 2 qrs.	„	13	8	4	„ ton.
3.	3 qrs. 17 lbs.	„	1	10	11	„ qr.
4.	7 lbs. 5 oz. 4 dwts.	„	2	17	6	„ lb.
5.	32 lbs. 7 oz. 10 dwts.	„		15	0	„ lb.
6.	16 yds. 3 qrs. 2 n.	„	2	3	8	„ yd.
7.	25 yds. 1 ft. 7 in.	„	1	19	9	„ yd.
8.	13 a. 3 r. 10 p.	„	8	13	4	„ a.
9.	63 a. 1 r. 25 p.	„	4	16	8	„ a.
10.	13 qrs. 5 bush. 1 pk.	„	3	6	8	„ qr.

220.

			£	s.	d.	
1.	5 t. 4 cwt. 2 qrs.	at	2	1	1	per cwt.
2.	16 cwt. 2 qrs. 14 lbs.	„	65	6	8	„ ton.
3.	11 oz. 15 dwts. 12 grs.	„	9	0	0	„ lb.
4.	6 lbs. 8 oz. 5 dwts.	„		3	5	„ oz.
5.	15 yds. 10 in.	„		12	3	„ ft.
6.	2 qrs. 3 n.	„	3	9	8	„ yd.
7.	24 a. 2 r. 15 p.	„	5	0	10	„ r.
8.	4 sq. yds. 3 sq. ft. 72 sq. in.	„		4	$2\frac{1}{2}$	„ sq. ft.
9.	2 r. 27 p.	„	15	6	8	„ a.
10.	3 r. 16 p.	„	134	16	8	„ a.

BILLS OF PARCELS.

A bill of parcels or an invoice is a statement of articles sold by one person to another, with the price of each and the total price.

Example.

Mrs. RAMSDEN.

Bought of W. JONES.

1878.			£	*s.*	*d.*
Jan. 20.	15 lbs. bacon at	$9\frac{1}{4}d.$ per lb.		11	$6\frac{3}{4}$
,,	$10\frac{1}{2}$,, lard ,,	$11d.$,,		9	$7\frac{1}{2}$
,,	16 ,, cheese ,,	$8\frac{1}{2}d.$,,		11	4
,,	$5\frac{1}{4}$,, butter ,,	$1s.\ 6d.$,,		7	$10\frac{1}{2}$
,,	3 doz. eggs ,,	$1s.\ 5d.$ per doz.		4	3
			2	4	$7\frac{1}{4}$

221. Find the amounts of the following bills.

1. Mr. W. ROBINSON.

Bought of R. BROWN.

1878.		
Jan. 1.	7 lbs. sugar	at $5d.$ per lb.
,,	5 oz. tea	,, $4d.$,, oz.
,,	3 lbs. candles	,, $8d.$,, lb.
,,	6 lbs. rice	,, $3d.$,, lb.
,,	2 oz. mustard	,, $2d.$,, oz.

2. Rev. J. WALSH.

Bought of RIVERS & Co.

1879.		
June 10.	4 doz. boxes matches	at $7d.$ per doz.
,,	5 oz. pepper	,, $\frac{1}{2}d.$,, oz.
,,	8 oz. nutmegs	,, $3d.$,, oz.
Feb. 3.	10 lbs. raisins	,, $6d.$,, lb.
,,	2 jars salt	,, $5d.$,, jar.

3. Miss JAMES.

To D. WATERS.

1875.			
May 3.	6 qts. milk	at	4*d.* per qt.
,,	2 pts. cream	,,	1*s.* 0*d.* ,, pt.
,,	3 lbs. butter	,,	1*s.* 3*d.* ,, lb.
,,	2 lbs. do.	,,	1*s.* 6*d.* ,, lb.

4. J. HEAD, Esq.

To A. DICKINSON.

1881.			
Dec. 5.	8 lbs. sugar	at	5*d.* per lb.
,,	6 oz. tea	,,	4*d.* ,, oz.
,,	4 lbs. rice	,,	3*d.* ,, lb.
,,	8 lbs. candles	,,	6*d.* ,, lb.
,,	4 oz. pepper	,,	¾*d.* ,, oz.

5. Miss MARSHALL.

To THOMPSON & Co.

1876.			
May 15.	6 cups	at	5*d.* each.
,,	6 saucers	,,	4*d.* ,,
,,	2 milk jugs	,,	1*s.* 6*d.* ,,
June 1.	8 glasses	,,	6*d.* ,,
,,	3 decanters	,,	2*s.* 6*d.* ,,

222.

Make out bills for the following articles, putting in names and dates—

1. 9 reels cotton at 1*d.* each; 4 yds. ribbon at 8*d.* per yd.; 6 handkerchiefs at 1*s.* 4*d.* each; 4 ties at 9*d.* each; 8 yds. calico at 9*d.* per yd.

2. 4 lbs. rice at 5½*d.* per lb.; 8 lbs. raisins at 10*d.* per lb.; 12 lbs. prunes at 4*d.* per. lb.; 11 lbs. candles at 1*s.* 2*d.* per lb.; 2 oz. tea at 4½*d.* per oz.

3. 2 stones sugar at 4*s.* 8*d.* per st.; 6 lbs. cheese at 1*s.* 2*d.* per lb.; 1 qr. rice at 26*s.* per cwt.; 6 lbs. sago at 2½*d.* per lb.; 2 lbs. tapioca at 8*d.* per lb.

4. 4 lbs. tartaric acid at 2*s.* per lb.; 8 oz. camphor at 2½*d.* per oz.; 6 lbs. sulphur at 6¼*d.* per lb.; 3 oz. quinine at 8*s.* per oz.; 4 yds. oiled silk at 4*s.* 1½*d.* per yd.

5. 11 lbs. beef at 10½*d.* per lb.; 9 lbs. mutton at 9*d.* per lb.; 3 ox tongues at 3*s.* 3*d.* each; 4 lbs. sausages at 8¾*d.* per lb.; 6 lbs. veal at 10*d.* per lb.

6. 12 lbs. candles at 10*d.* per lb.; 6 lbs. sago at 3*d.* per lb.; 8 oz. mustard at 2¼*d.* per oz.; 6 tablets soap at 7½*d.* each; 1 stone sugar at 3*d.* per lb.

7. 6 dozen buttons at 2¼*d.* per doz.; 16 yds. calico at 1*s.* 2*d.* per yd.; 12 yds. braid at 1½*d.* per yd.; 4 yds. cloth at 6*s.* 5*d.* per yd.; 6 yds. dimity at 1*s.* 3*d.* per yd.

8. 8 pairs gloves at 2*s.* 6*d.* per pair; 5 pairs hose at 1*s.* 2*d.* per pair; 9 shirt fronts at 1*s.* 6*d.* each; 1 doz. scarves at 3*s.* each; ½ doz. collars at 6*s.* 6*d.* per doz.

9. 14 loaves bread at 7½*d.* each; 3 lbs. biscuits at 8*d.* per lb.; 5 lbs. do. at 6½*d.* per lb.; 2 plum cakes at 3*s.* 4½*d.* each.

10. 12 jars salt at 4½*d.* per jar; 3 tins sardines at 11½*d.* per tin; 5 lbs. tapers at 1*s.* 9*d.* per lb.; 9 lbs. starch at 7*d.* per lb.; 2 boxes figs at 1*s.* 8*d.* each.

11. 13 lbs. rice at 5*d.* per lb.; 1 stone sugar at 4½*d.* per lb.; 1 stone sugar at 5*d.* per lb.; 8 lbs. cheese at 10¼*d.* per lb.; 10 lbs. raisins at 1*s.* 3*d.* per lb.

12. 10 lbs. beef at 11½*d.* per lb.; 5 lbs. mutton at 10*d.* per lb.; 2 lbs. sausages at 9¼*d.* per lb.; 5 sheep's kidneys at 2½*d.* each; 3 lbs. suet at 7½*d.* per lb.; 1 ox tongue at 3*s.* 8*d.*

13. 7 gals. potatoes at 8½*d.* per gal.; 8 baskets strawberries at 10*d.* per basket; 3 qrts. gooseberries at 5½*d.* per qrt.; 6 lemons at 2½*d.* each; 3 cucumbers at 1*s.* 8½*d.* each.

14. 7 yds. calico at 10*d.* per yd.; 16 yds. flannel at 3*s.* 6*d.* per yd.; 10 knots tape at 1½*d.* each; 2 doz. reels of cotton at 2½*d.* each; 1 doz. collars at 1*s.* 1*d.* each.

15. 4 pairs shoes at 7*s.* per pair; 3 pairs slippers at 2*s.* 6*d.* per pair; 2 doz. laces at 9*d.* per doz.; 2 pairs boots at 21*s.* per pair; 3 pairs boots at 40*s.* per pair; soling 4 pairs boots at 4*s.* 6*d.* each.

16. 3 bonnets at 24*s.*, 35*s.*, and 54*s.* each; 5 pairs gloves at 2*s.* 9*d.* per pair; 6 pairs hose at 2*s.* 3*d.* per pair; 18 yds. braid at 2*s.* 3*d.* per yd.; 11 yds. silk at 5*s.* 3*d.* per yd.

17. 8 pear trees at 2*s.* 4*d.* each; 3 doz. currant bushes at 3½*d.* each; 7 doz. laurels at 5*s.* 6*d.* per doz.; 8 loads of soil at 3*s.* 5*d.* per load; man's time, 5 days at 3*s.* 3*d.* per day.

18. 4 tons of coal at 27*s.* 6*d.* per ton; 3 tons of coal at 31*s.* per ton; 10 sacks coke at 2*s.* 1*d.* per sack; 12 bundles firewood at 3½*d.* each; 3 loads manure at 4*s.* 3*d.* per load.

19. 3 doz. claret at 36*s.* per doz.; ½ doz. Madeira at 100*s.* per doz.; 2 doz. champagne at 76*s.* per doz.; ½ doz. sherry at 48*s.* per doz.; 4 doz. bottled ale at 5*s.* per doz.

20. 18 gals. ale at 1*s.* 3*d.* per gal.; 36 gals. ale at 10*d.* per gal.; 4 doz. lemonade at 3*s.* 6*d.* per doz.; 3½ doz. soda water at 4*s.* per doz.; 6 doz. bottles at 1½*d.* each.

21. 6 mole traps at 7*d.* each; repairing scissors, 4*d.*; 6 lamp glasses at 8*d.* each; 2½ gals. crystal oil at 2*s.* 8*d.* per gal.; 3 lbs. copper wire at 1*s.* 3*d.* per lb.; 5 lbs. nails at 4½*d.* per lb.

22. 2 sacks oats at 27*s.* 3*d.* per sack; 1½ bush. barley at 5*s.* 6*d.* per bush.; 2 gals. flour at 1*s.* 1½*d.* per gal.; 1¼ bush. maize at 6*s.* per bush.; 5 sacks pollards at 6*s.* 6*d.* per sack.

23. 4 cwt. coal at 30*s.* per ton; 2 loads wood at 6*s.* 3*d.* per load; 10 cwt. coal at 25*s.* per ton; 12 bundles chips at 1½*d.* each.

24. 2 doz. port at 54*s.* per doz.; $5\frac{1}{2}$ doz. sherry at 25*s.* per doz.; 3 doz. sauterne at 72*s.* per doz.; $1\frac{1}{2}$ doz. hock at 60*s.* per doz.; 4 bottles brandy at 66*s.* per doz.

25. $2\frac{1}{2}$ lbs. bacon at 10*d.* per lb.; $7\frac{1}{4}$ lbs. cheese at 8*d.* per lb.; 9 lbs. sugar at $4\frac{1}{4}d.$ per lb.; 13 lbs. ground rice at 5*d.* per lb.; 8 oz. tea at 2*s.* 11*d.* per lb.; $\frac{1}{4}$ lb. butter at 1*s.* 6*d.* per lb.

26. 19 lbs. 8 oz. beef at 1*s.* $0\frac{1}{2}d.$ per lb.; 7 lbs. 4 oz. veal at 11*d.* per lb.; 5 lbs. 8 oz. rump steak at 1*s.* 3*d.* per lb.; 11 lbs. mutton at $11\frac{1}{2}d.$ per lb.; 8 lbs. pork at $10\frac{1}{2}d.$ per lb.

27. $10\frac{1}{2}$ yds. velvet at 16*s.* 6*d.* per yd.; 25 yds. silk at 8*s.* 4*d.* per yd.; 14 yds. braid at 1*s.* 9*d.* per yd.; $5\frac{1}{2}$ doz. buttons at 2*s.* 3*d.* per doz.; 5 yds. lining at 8*d.* per yd.; $6\frac{1}{4}$ yds. ribbon at 1*s.* 11*d.* per yd.

28. 3 pairs gloves at 2*s.*, 3*s.* 9*d.*, and 5*s.* 9*d.* per pair; 2 hats at 6*s.* 6*d.* and 8*s.* 9*d.* each; $8\frac{1}{4}$ yds. ribbon at 11*d.* per yd.; $\frac{1}{2}$ doz. pairs hose at 2*s.* 2*d.* per pair; 18 yds. elastic at $1\frac{1}{2}d.$ per yd.; 13 yds. braid at $3\frac{1}{2}d.$ per yd.

29. $12\frac{1}{4}$ lbs. mutton at 11*d.* per lb.; $13\frac{1}{4}$ lbs. veal at 1*s.* per lb.; $5\frac{1}{2}$ lbs. rump steak at 1*s.* 1*d.* per lb.; $2\frac{1}{2}$ lbs. suet at 10*d.* per lb.; $17\frac{1}{2}$ lbs. beef at 1*s.* $0\frac{1}{2}d.$ per lb.; 4 lbs. chops at 1*s.* 2*d.* per lb.

30. $13\frac{1}{2}$ lbs. cheese at 1*s.* 9*d.* per lb.; $8\frac{1}{4}$ lbs. sausages at 1*s.* 10*d.* per lb.; $19\frac{1}{2}$ lbs. lard at $9\frac{1}{2}d.$ per lb.; $9\frac{1}{2}$ lbs. butter at 1*s.* $6\frac{1}{2}d.$ per lb.; 15 lbs. raisins at 1*s.* $5\frac{1}{2}d.$ per lb.; 6 bottles sauce at 1*s.* $7\frac{1}{2}d.$ each; 10 tablets soap at $7\frac{1}{2}d.$ each.

31. 3 rugs at 10*s.* 6*d.* each; 1 Turkey carpet at 10 *gs.*; $11\frac{1}{2}$ yds. flannel at 3*s.* 6*d.* per yd.; $2\frac{1}{2}$ doz. towels at 16*s.* 6*d.* per doz.; 4 doz. dusters at 4*s.* 9*d.* per doz.; $12\frac{1}{2}$ yds. linen at 2*s.* $7\frac{1}{2}d.$ per yd.; $5\frac{1}{4}$ yds. calico at 1*s.* 7*d.* per yd.

32. $8\frac{1}{2}$ oz. glycerine at 4*d.* per oz.; $\frac{1}{2}$ doz. bottles of seltzer water at 3*s.* 6*d.* per doz.; $1\frac{1}{2}$ doz. soda water at

2*s.* 6*d.* per doz.; 3 bottles eau de Cologne at 3*s.* 9*d.* each; 4 physic balls at 6*d.* each; 8 tins food at 2*s.* each.

33. 14 yds. muslin at 1*s.* 6*d.* per yd.; 10½ yds. cambric at 8½*d.* per yd.; 8¼ yds. lace at 7*s.* 11*d.* per yd.; 7½ yds. net at 1*s.* 9½*d.* per yd.; 13 yds. damask at 2*s.* 11½*d.* per yd.; 4¼ yds. repp at 5*s.* 9*d.* per yd.; 8½ yds. dimity at 1*s.* 2½*d.* per yd.

34. 14 lbs. 8 oz. veal at 11*d.* per lb.; 8 lbs. 4 oz. beef at 1*s.* 1*d.* per lb.; 13 lbs. 12 oz. mutton at 11*d.* per lb.; 5 lbs. 8 oz. steak at 10*d.* per lb.; 9 lbs. pork at 10½*d.* per lb.; 7 lbs. 8 oz. rump steak at 1*s.* 3*d.* per lb.; 8 lbs. suet at 9*d.* per lb.

35. 5 st. sugar at 4½*d.* per lb.; 3 st. sugar at 3½*d.* per lb.; 1½ st. tapioca at 5½*d.* per lb.; 10¾ lbs. starch at 5*d.* per lb.; 8½ lbs. nutmeg at 4*s.* 6*d.* per lb.; 10½ lbs. raisins at 1*s.* 3*d.* per lb.; 2½ lbs. biscuits at 1*s.* 7*d.* per lb.

GREATEST COMMON MEASURE.

A number is called a *measure* or *factor* of another when it is contained an exact number of times in it.

Thus 2, 3, 6, 9, are measures of 18.

A *common measure* of two or more numbers is any number which is a measure of all of them.

Thus 4 is a common measure of 24, 32, and 48.

The *greatest common measure* of two or more numbers is the greatest number which is contained an exact number of times in all of them.

1 is not usually reckoned among the common measures of two numbers, and those numbers which have no common divisor greater than 1 are said to be *prime to one another.*

Thus 20 and 27 are prime to one another.

Prime numbers are those which have no measure or divisor greater than 1.

Thus 7, 11, 23, 47, &c., are prime numbers.

The phrase, greatest common measure, is often abbreviated into G.C.M.

To find the G.C.M. of two numbers.

Rule. Divide the greater of the two numbers by the less, then divide the divisor by the remainder, and continue the process until there is no remainder: the last divisor is the required G.C.M.

Example.—Find the G.C.M. of 494 and 1102.

```
494)1102(2
    988
    ---
114)494(4
    456
    ---
 38)114(3
    114
```

Hence, according to the rule, 38 is the G.C.M. required.

If the G.C.M. of three numbers be required, the G.C.M. of two of them must first be found, and then the G.C.M. of this and the remaining number. In a similar way we may find the G.C.M. of any number of numbers.

223. Find the G.C.M. of—

1.	341	and 403.	*11.*	1798	and 8494.
2.	702	„ 486.	*12.*	3804	„ 32651.
3.	289	„ 204.	*13.*	2336	„ 14004.
4.	1155	„ 2079.	*14.*	12193	„ 13426.
5.	708	„ 3612.	*15.*	22139	„ 49609.
6.	7569	„ 783.	*16.*	37638	„ 52887.
7.	747	„ 963.	*17.*	19551	„ 16842.
8.	9727	„ 6713.	*18.*	49218	„ 7956.
9.	32723	„ 7740.	*19.*	59283	„ 36018.
10.	5141	„ 25996.	*20.*	50792	„ 21385.

224.—Find the G.C.M. of—

1. 502, 936, and 8736.
2. 1144, 676, and 1859.
3. 618, 1030, and 1545.
4. 2244, 6188, and 357.
5. 4872, 13454, and 1113.

LEAST COMMON MULTIPLE.

A multiple of a number is any number which contains it an exact number of times.

Thus 8, 24, 404 are multiples of 4.

The least common multiple of two or more numbers is the least number which is a multiple of each of them, or which contains each exactly.

Thus the least common multiple of 4, 6, 8 is 24.

The term, least common multiple, is abbreviated into L.C.M.

To find the L.C.M. of any numbers—

Rule. Place the numbers in a line, and strike out any which are exactly contained in any of the others: choose any number which divides *at least* one of the given numbers, place it on the left, and, dividing all the numbers that will divide by it, set down the quotients below them.

If any of the given numbers, though not divisible by the chosen number itself, is divisible by some factor of that number, divide it by that factor, and set down the quotient: the rest of the numbers are to be set down as they are.

Repeat the process with the new line of numbers, and so on until no longer possible. The product of the numbers in the last line, and those chosen as divisors, is the L.C.M. required.

Example.—Find the L.C.M. of 8, 14, 21, 12, 20, 15, 24.

$$\begin{array}{r} 15\,)\,\cancel{8},\ 14,\ 21,\ \cancel{12},\ 60,\ 45,\ 24. \\ \hline 2\,)\,14,\ \cancel{7},\ \cancel{4},\ 3,\ 8. \\ \hline 7,\ \qquad\qquad 3,\ 4. \end{array}$$

$$\text{L.C.M.} = 15 \times 2 \times 7 \times 3 \times 4 = 2520.$$

8 and 12 are contained in 24, therefore we cross them out at once : 15 divides both 60 and 45, hence we choose it as a divisor, and under those numbers write the quotients 4 and 3. 14 is written down unchanged, for it cannot be divided by 15, nor by 5 or 3, its factors ; 21 and 24, though they are not divisible by 15, are divisible by its factor 3, hence the quotients 7 and 8 are set down.

We now cross out the 7, for it is contained in 14, and the 4, for it is contained in 8, and take 2 as a divisor, giving us the numbers 7, 3, 4, no two of which have a common factor, so we cannot proceed further, but multiply the divisors and the figures of the last line together for the answer.

225.—Find the L.C.M. of—

1. 2, 6, 9, 12, 10.
2. 3, 15, 8, 20, 32.
3. 18, 7, 27, 35, 45.
4. 16, 14, 28, 4, 56.
5. 18, 12, 24, 36, 32, 9.
6. 63, 7, 36, 9, 21, 14.
7. 100, 55, 11, 15, 75.
8. 26, 39, 13, 18, 12, 8.
9. 72, 36, 42, 28, 7, 16.
10. 10, 6, 144, 66, 132, 36.
11. 32, 48, 16, 36, 27, 12.
12. 9, 8, 15, 21, 35, 63.
13. 26, 13, 6, 30, 21, 35.
14. 28, 9, 14, 8, 16, 42, 54.
15. 39, 13, 12, 7, 18, 28, 42.
16. 96, 32, 8, 27, 15, 20, 24.
17. 38, 19, 6, 15, 57, 20.
18. 132, 66, 46, 69, 48, 24, 36.
19. 51, 28, 34, 35, 10, 68.

FRACTIONS.

To express quantities which do not contain the unit of measurement an exact number of times, we may imagine the unit divided into a certain number of equal parts, and specify how many of these are to be taken: thus we speak of five-eighths of an inch, meaning that if an inch were divided into eight equal parts, the length we wish to express would be equal to five of these parts. Such expressions are called *fractions*. A fraction is expressed in writing by means of two numbers separated by a line, of which the lower, called the *denominator*, tells into how many parts the unit is divided; the upper, called the *numerator*, tells how many of these are to be taken.

A fraction may also be considered as the result of dividing by the denominator the number of units indicated by the numerator. For example, $\frac{3}{4}$ in. means three times the fourth part of 1 in., and hence must be the fourth part of 3 in., or $\frac{3}{4}$ in. = 3 in. ÷ 4.

A *proper fraction* is one in which the numerator is less than the denominator, and which, therefore, represents a quantity less than the unit. Thus $\frac{3}{4}$, $\frac{7}{10}$, $\frac{83}{127}$ are proper fractions.

An *improper fraction* is one in which the numerator is greater than the denominator, and which, therefore, represents a quantity greater than the unit. Thus $\frac{5}{4}$, $\frac{13}{10}$, $\frac{129}{84}$ are improper fractions.

A *mixed number* is a whole number and a fraction; thus $3\frac{3}{8}$ inches, meaning three inches and three-eighths of an inch, is a mixed number.

Mixed numbers and improper fractions. To reduce an improper fraction to a mixed number, divide the numerator by the denominator: the quotient will give the whole number, and the remainder the numerator of the fractional part.

Thus $\frac{43}{12}$ is equal to $3\frac{7}{12}$.

To reduce a mixed number to an improper fraction, multiply the whole number by the denominator of the fraction and add the numerator; this will give the numerator of the fraction required.

Thus $7\frac{4}{11} = \frac{81}{11}$.

226.—Reduce to mixed numbers—

1. $\frac{9}{4}$, $\frac{11}{3}$, $\frac{13}{5}$, $\frac{87}{12}$.
2. $\frac{37}{8}$, $\frac{59}{7}$, $\frac{63}{2}$, $\frac{202}{3}$.
3. $\frac{137}{6}$, $\frac{598}{11}$, $\frac{637}{10}$, $\frac{730}{9}$.
4. $\frac{72}{18}$, $\frac{91}{16}$, $\frac{139}{17}$, $\frac{642}{83}$.
5. $\frac{600}{29}$, $\frac{7563}{100}$, $\frac{8824}{127}$.
6. $\frac{538671}{622}$, $\frac{63001}{713}$, $\frac{10375}{92}$.
7. $\frac{62509}{780}$, $\frac{18104}{205}$, $\frac{93672}{755}$.
8. $\frac{100000}{631}$, $\frac{75632}{47}$, $\frac{85037}{7136}$.

227.—Express as improper fractions—

1. $2\frac{3}{7}$, $1\frac{1}{4}$, $8\frac{2}{9}$, $12\frac{3}{8}$.
2. $18\frac{1}{6}$, $5\frac{3}{11}$, $72\frac{1}{2}$, $6\frac{3}{20}$.
3. $5\frac{3}{18}$, $8\frac{8}{19}$, $3\frac{7}{22}$, $12\frac{1}{30}$.
4. $736\frac{4}{18}$, $805\frac{13}{21}$, $103\frac{20}{21}$.
5. $17\frac{54}{103}$, $173\frac{8}{99}$, $35\frac{12}{57}$.
6. $162\frac{100}{101}$, $2\frac{796}{831}$, $1\frac{173}{5907}$.
7. $32\frac{78}{631}$, $56\frac{7}{1000}$, $832\frac{5}{18}$.
8. $91\frac{30}{77}$, $60\frac{812}{1031}$, $635\frac{12}{831}$.

The value of a fraction is not altered by multiplying or dividing both numerator and denominator by the same number.

Thus $\frac{5}{6} = \frac{15}{18}$, for $\frac{5}{6}$ means that the unit is divided into 6 parts, of which 5 are taken; now if each of these six parts be again divided into 3 parts, so that now the unit is divided into 3×6, or 18 parts, it is clear that the 5 parts that were taken will become 5×3, or 15 parts; thus the same quantity which was represented by five *sixth* parts of the unit will be represented by fifteen *eighteenth* parts.

When, then, the numerator and denominator of a fraction are both divisible by the same number, we may by performing the division express the fraction in lower terms, *i.e.*, with smaller numerator and denominator, without altering its value.

A fraction is said to be in its *lowest terms* when the numerator and denominator have no common measure by which they may be divided; in other words, when they are *prime* to each other.

To reduce any fraction to its lowest terms we must divide both numerator and denominator by their greatest common measure.

Example.—Reduce $\frac{249}{1079}$ to its lowest terms.

83 is found to be the G.C.M. of 249 and 1079, hence dividing by 83 we obtain $\frac{3}{13}$ as the simplest form of $\frac{249}{1079}$.

Very frequently we can see by inspection what numbers will divide the numerator and denominator, and thus avoid finding the G.C.M.

Example.—$\frac{105}{165} = \frac{21}{33} = \frac{7}{11}$, the successive divisors being 5 and 3.

The following rules are useful in finding the simple divisors of a number—

1. If the last figure be even, *i.e.*, divisible by 2, the number is even.

2. If the last two figures taken together be divisible by 4, the whole is divisible by 4; thus 1648 is divisible by 4 because 48 is so.

3. If all the figures of a number added together be divisible by 3, the number is itself divisible by 3; if the same sum be divisible by 9 the number is divisible by 9. Thus 7326 can be divided by 9, for $7 + 3 + 2 + 6 = 18$, and is divisible by 9.

4. Any number which ends in 5 or 0 is divisible by 5.

228.—Reduce to their lowest terms—

1. $\frac{14}{16}, \frac{15}{18}, \frac{5}{10}$.
2. $\frac{25}{35}, \frac{14}{49}, \frac{45}{63}$.
3. $\frac{33}{110}, \frac{72}{88}, \frac{65}{70}$.
4. $\frac{84}{96}, \frac{12}{72}, \frac{10}{1000}$.
5. $\frac{26}{32}, \frac{27}{36}, \frac{70}{610}$.
6. $\frac{39}{57}, \frac{28}{84}, \frac{27}{207}$.
7. $\frac{75}{125}, \frac{231}{264}, \frac{96}{232}$.
8. $\frac{320}{480}, \frac{225}{315}, \frac{102}{144}$.
9. $\frac{216}{246}, \frac{156}{1104}, \frac{72}{432}$.
10. $\frac{102}{696}, \frac{275}{325}, \frac{425}{600}$.

229.

1. $\frac{945}{2520}, \frac{539}{1232}, \frac{975}{2550}$.
2. $\frac{1617}{1764}, \frac{1875}{4375}, \frac{2112}{2496}$.
3. $\frac{4067}{4949}, \frac{3069}{7524}, \frac{216}{3276}$.
4. $\frac{6678}{7686}, \frac{2880}{5184}, \frac{9075}{10725}$.
5. $\frac{1260}{9555}, \frac{4305}{13755}, \frac{9216}{13056}$.
6. $\frac{5445}{6534}, \frac{12012}{15708}, \frac{10944}{63936}$.

230.—Reduce to their lowest terms (by G.C.M.)—

1. $\frac{187}{221}, \frac{270}{486}, \frac{756}{819}$.
2. $\frac{1275}{1955}, \frac{2489}{5144}, \frac{1515}{8835}$.
3. $\frac{219}{3189}, \frac{259}{888}, \frac{1679}{2263}$.
4. $\frac{769}{13842}, \frac{4693}{10830}, \frac{232}{5800}$.
5. $\frac{4029}{47479}, \frac{1662}{12465}, \frac{7183}{10448}$.
6. $\frac{17013}{21253}, \frac{2201}{9301}, \frac{11093}{13467}$.

To multiply a fraction by any number. Multiply the numerator by that number.

Example.—$\frac{9}{13} \times 7 = \frac{63}{13} = 4\frac{11}{13}$.

For it is clear that 7 times 9 thirteenth parts of anything must be 63 thirteenth parts, or $\frac{63}{13}$.

To multiply a mixed number by a whole number, we may either bring it to an improper fraction and proceed as above, or as in the following example.

Example.—Multiply $3\frac{5}{6}$ by 7.

$\frac{5}{6} \times 7 = \frac{35}{6} = 5\frac{5}{6}$, and $3 \times 7 = 21$, which added to $5\frac{5}{6}$ gives $26\frac{5}{6}$.

231.

1. $\frac{3}{4} \times 5$.
2. $\frac{8}{11} \times 9$.
3. $\frac{12}{17} \times 8$.
4. $\frac{13}{20} \times 11$.
5. $\frac{32}{33} \times 10$.
6. $\frac{36}{41} \times 13$.
7. $\frac{80}{85} \times 21$.
8. $\frac{3}{142} \times 71$.
9. $\frac{1}{39} \times 107$.

232.

1.	$1\frac{2}{3} \times 7.$	*4.*	$7\frac{3}{20} \times 9.$	*7.*	$1\frac{1}{100} \times 15.$
2.	$8\frac{3}{11} \times 3.$	*5.*	$15\frac{1}{3} \times 4.$	*8.*	$3\frac{17}{39} \times 18.$
3.	$4\frac{5}{12} \times 5.$	*6.*	$12\frac{7}{30} \times 4.$	*9.*	$7\frac{5}{28} \times 22.$

To divide a fraction by a whole number, multiply the denominator by that number.

Example.— $\frac{8}{11} \div 3 = \frac{8}{33}$.

For one thirty-third part is one-third of one eleventh part, and therefore 8 thirty-third parts are one-third of 8 eleventh parts.

A mixed number must be reduced to an improper fraction before applying the above rule.

Find the value of

233.

1.	$\frac{5}{12} \div 4.$	*6.*	$\frac{42}{43} \div 21.$
2.	$\frac{13}{15} \div 7.$	*7.*	$\frac{100}{137} \div 15.$
3.	$\frac{8}{30} \div 5.$	*8.*	$\frac{27}{38} \div 18.$
4.	$\frac{18}{23} \div 12.$	*9.*	$\frac{85}{92} \div 17.$
5.	$\frac{7}{8} \div 28.$	*10.*	$\frac{56}{61} \div 16.$

234.

1.	$1\frac{7}{9} \div 4.$	*6.*	$4\frac{2}{5} \div 4.$
2.	$2\frac{1}{17} \div 15.$	*7.*	$17\frac{1}{2} \div 14.$
3.	$3\frac{9}{11} \div 28.$	*8.*	$4\frac{16}{21} \div 15.$
4.	$6\frac{3}{8} \div 3.$	*9.*	$3\frac{7}{18} \div 23.$
5.	$6\frac{1}{3} \div 19.$	*10.*	$7\frac{13}{17} \div 121.$

Example.—Divide £73 14*s.* $10\frac{3}{4}$*d.* by 10.

	£	*s.*	*d.*
10)	73	14	$10\frac{3}{4}$
	7	7	$5\frac{7}{8}$

$8\frac{3}{4}d. \div 10 = \frac{35}{4} \div 10 = \frac{35}{40} = \frac{7}{8}d.$

The division proceeds as usual until we get 8 over from the pence: in working this and similar questions, the pupil must be cautioned against reducing this remainder to farthings: the $8\frac{3}{4}$*d.* is to be divided by 10 as in the margin.

235.

	£	s.	d.	
1.	11	7	$1\frac{1}{4}$	$\div 2$.
2.	52	14	$11\frac{1}{4}$	$\div 4$.
3.	187	12	$5\frac{3}{4}$	$\div 5$.
4.	46	18	$3\frac{5}{8}$	$\div 7$.
5.	160	8	$9\frac{1}{3}$	$\div 12$.
6.	148	5	$3\frac{1}{10}$	$\div 7$.
7.	161	9	$4\frac{8}{11}$	$\div 10$.
	yds.	ft.	in.	
8.	45	2	$7\frac{1}{8}$	$\div 6$.
9.	8	2	$5\frac{1}{2}$	$\div 4$.
10.	52	2	$3\frac{3}{4}$	$\div 12$.

236.

	£	s.	d.	
1.	30	4	10	$\div 14$.
2.	121	0	6	$\div 16$.
3.	250	12	$2\frac{2}{3}$	$\div 20$.
4.	262	3	$11\frac{1}{5}$	$\div 28$.
5.	312	5	$10\frac{1}{2}$	$\div 24$.
6.	377	10	$0\frac{3}{4}$	$\div 63$.
7.	1797	4	4	$\div 99$.
8.	36	7	6	$\div 42$.
9.	138	7	10	$\div 49$.
10.	834	2	$4\frac{1}{4}$	$\div 80$.

To find the value of a fraction of any given quantity, divide the given quantity by the denominator of the fraction, and multiply the result by the numerator.

Example.—Find the value of $\frac{5}{12}$ of £3 17*s.* 6*d.*

	£	s.	d.	
12)	3	17	6	
		6	$5\frac{1}{2}$	$= \frac{1}{12}$ of £3 17*s.* 6*d.*
			5	
	1	12	$3\frac{1}{2}$	$= \frac{5}{12}$ „

By an *extension of the meaning* of multiplication, the operation of finding a fraction of any quantity is spoken of as *multiplying* the quantity by the given fraction, and is denoted by the sign ×. Hence the example last worked might have been set thus—

Multiply £3 17*s.* 6*d.* by $\frac{5}{12}$; or
Find the value of £3 17*s.* 6*d.* × $\frac{5}{12}$.

If the multiplier be a mixed number, we may either bring it to an improper fraction, and proceed as above, or work as in the following example.

Example.—Multiply 13 cwt. 3 qrs. 14 lbs. by $3\frac{1}{7}$.

	cwts.	qrs.	lbs.	
7)	13	3	14	
	1	3	26	$= \frac{1}{7}$ of given quantity
			4	
	t. 7	3	20	$= \frac{1}{7}$ "
	2 1	2	14	$= 3$ "
	2 9	2	6	$= 3\frac{1}{7}$ "

Find the value of—

237.

1. $\frac{1}{8}$ of £5 14*s.* 4*d.*
2. $\frac{3}{4}$ of £17 15*s.* 5*d.*
3. $\frac{8}{11}$ of £12 14*s.* 10*d.*
4. $\frac{6}{7}$ of £24 10*s.* $8\frac{3}{4}$*d.*
5. $\frac{3}{5}$ of 7 tons.
6. $\frac{4}{9}$ of 10 t. 9 cwt. 1 qr.
7. $\frac{9}{10}$ of 6 t. 10 c. 1 q. 2 lbs.
8. $\frac{7}{15}$ of 19 h. 31 m. 12 s.
9. $\frac{2}{15}$ of 1 day.
10. $\frac{8}{21}$ of 83 yds. 1 ft. 11 in.

238.

1. £31 12*s.* $7\frac{1}{2}$*d.* $\times 3\frac{1}{2}$.
2. £15 2*s.* $1\frac{1}{2}$*d.* $\times 5\frac{2}{3}$.
3. £68 4*s.* 5*d.* $\times 1\frac{5}{7}$.
4. 3 m. 5 f. 25 p. $\times 7\frac{2}{5}$.
5. 25 yds. 2 ft. 6 in. $\times 12\frac{9}{10}$.
6. 42 a. 3 r. 36 p. $\times 7\frac{11}{12}$.
7. 93 a. 1 r. 38 p. $\times 13\frac{1}{18}$.
8. 27 t. 12 cwt. 3 qrs. 12 lbs. $\times 3\frac{5}{24}$.
9. 4 oz. 15 dwts. 20 grs. $\times 9\frac{12}{21}$.
10. 43 lbs. 5 oz. 2 dwts. $\times 10\frac{11}{27}$.

To find the value of a fraction of a fraction, or to multiply one fraction by another, multiply the numerators for a new numerator, and the denominators for a new denominator.

Example.—What fraction of a cake is $\frac{3}{4}$ of $\frac{5}{7}$ of it?

Just as above, in finding a fraction of any quantity, we must divide $\frac{5}{7}$ by 4, which gives $\frac{5}{28}$, and multiply this by 3, giving $\frac{15}{28}$ or $\frac{5 \times 3}{7 \times 4}$.

The sign × placed between two fractions is to be considered as equivalent to the word "of."

The same process applies, whatever be the number of fractions.

Example.—$\frac{1}{2} \times \frac{3}{4} \times \frac{5}{7} \times \frac{9}{11} = \frac{3 \times 5 \times 9}{2 \times 4 \times 7 \times 11} = \frac{135}{616}$.

Mixed numbers must be brought to improper fractions before multiplication.

Example.—$3\frac{1}{3} \times \frac{5}{7} \times 4\frac{1}{7} = \frac{10}{3} \times \frac{5}{7} \times \frac{29}{7} = \frac{1450}{147} = 9\frac{127}{147}$.

239.

1. $\frac{3}{5}$ of $\frac{4}{7}$.
2. $\frac{5}{9}$ of $\frac{10}{11}$.
3. $\frac{7}{12}$ of $\frac{13}{15}$.
4. $\frac{3}{8}$ of $\frac{5}{17}$.
5. $\frac{11}{20}$ of $\frac{7}{19}$.
6. $\frac{10}{27}$ of $\frac{19}{39}$.
7. $\frac{1}{15}$ of $\frac{73}{82}$.
8. $\frac{19}{71}$ of $\frac{1}{64}$.
9. $\frac{1}{39}$ of $\frac{1}{15}$.
10. $\frac{9}{19}$ of $\frac{17}{311}$.

240.

1. $2\frac{1}{2} \times 3\frac{1}{4}$.
2. $1\frac{3}{4} \times \frac{9}{11}$.
3. $5\frac{2}{9} \times \frac{17}{23}$.
4. $12\frac{1}{3} \times 2\frac{5}{6}$.
5. $8\frac{1}{7} \times 9\frac{1}{4}$.
6. $2\frac{1}{2} \times 12\frac{1}{12}$.
7. $\frac{3}{19} \times 4\frac{2}{11}$.
8. $\frac{3}{14} \times 1\frac{10}{13}$.
9. $1\frac{7}{10} \times 5\frac{1}{10}$.
10. $16\frac{1}{3} \times 2\frac{3}{19}$.

241.

1. $\frac{2}{3} \times \frac{5}{7} \times \frac{1}{9}$.
2. $\frac{4}{7} \times \frac{3}{11} \times \frac{1}{6}$.
3. $\frac{6}{13} \times \frac{2}{5} \times \frac{3}{11}$.
4. $\frac{4}{9} \times \frac{5}{17} \times \frac{2}{3}$.
5. $1\frac{1}{2} \times \frac{3}{4} \times 2\frac{1}{6}$.
6. $7\frac{3}{7} \times \frac{2}{3} \times \frac{10}{11}$.
7. $\frac{5}{7} \times 2\frac{2}{5} \times 3\frac{1}{11}$.
8. $3\frac{17}{18} \times 2\frac{15}{16} \times \frac{5}{7}$.
9. $4\frac{1}{3} \times 3\frac{1}{4} \times 1\frac{5}{6}$.
10. $2\frac{7}{8} \times 7\frac{3}{16} \times 2\frac{9}{13}$.

We may often simplify the multiplication of fractions by "cancelling," as it is termed. This will be best explained by an example.

Example.—Find the value of $\frac{5}{6} \times \frac{9}{11}$.

$\frac{5}{\cancel{6}_{2}} \times \frac{\cancel{9}^{3}}{11} = \frac{15}{22}$.

Here, before multiplying, we have divided the numerator of one fraction and the denominator of the other by 3. If we

had proceeded to multiply at once, we should have had $\frac{45}{36}$ as our result, and dividing by 3 this would have been reduced to $\frac{15}{12}$.

Thus, cancelling the factor 3 before multiplication saves us the trouble of doing it afterwards.

242.

1. $\frac{5}{18} \times \frac{9}{15}$.
2. $\frac{10}{14} \times \frac{7}{30}$.
3. $\frac{2}{5} \times \frac{15}{16}$.
4. $\frac{33}{55} \times \frac{7}{11}$.
5. $\frac{4}{9} \times \frac{6}{19}$.
6. $\frac{24}{49} \times \frac{14}{27}$.
7. $\frac{11}{18} \times \frac{36}{55}$.
8. $\frac{21}{26} \times \frac{32}{63}$.
9. $\frac{34}{55} \times \frac{45}{96}$.
10. $\frac{16}{27} \times \frac{81}{88}$.

243.

1. $\frac{4}{5} \times \frac{10}{12} \times \frac{9}{20}$.
2. $\frac{14}{27} \times \frac{63}{77} \times \frac{11}{49}$.
3. $\frac{15}{28} \times \frac{18}{35} \times \frac{14}{45}$.
4. $\frac{6}{7} \times \frac{14}{15} \times \frac{20}{33}$.
5. $\frac{3}{11} \times \frac{11}{17} \times \frac{17}{31}$.
6. $\frac{5}{8} \times \frac{9}{15} \times \frac{93}{100} \times \frac{10}{31}$.
7. $\frac{4}{35} \times \frac{63}{80} \times \frac{20}{21} \times \frac{1}{9}$.
8. $\frac{26}{33} \times \frac{11}{13} \times \frac{5}{6} \times \frac{3}{4}$.
9. $\frac{34}{39} \times \frac{26}{51} \times \frac{9}{16} \times \frac{1}{6}$.
10. $\frac{20}{31} \times \frac{62}{65} \times \frac{13}{24} \times \frac{6}{7}$.

244.

1. $2\frac{1}{17} \times \frac{2}{7}$.
2. $4\frac{3}{13} \times 3\frac{7}{11}$.
3. $5\frac{1}{3} \times 6\frac{3}{14}$.
4. $4\frac{8}{9} \times 2\frac{5}{8}$.
5. $9\frac{3}{4} \times \frac{16}{21}$.
6. $3\frac{1}{2} \times 4\frac{2}{7}$.
7. $13\frac{1}{10} \times 1\frac{2}{13}$.
8. $\frac{8}{21} \times 14\frac{7}{10}$.
9. $\frac{16}{15} \times 12\frac{3}{4}$.
10. $17\frac{1}{9} \times 11\frac{5}{14}$.

245.

1. $12\frac{3}{11} \times 2\frac{1}{5}$.
2. $\frac{9}{10} \times 13\frac{1}{3}$.
3. $4\frac{5}{8} \times \frac{4}{7} \times 4\frac{2}{3}$.
4. $6\frac{2}{5} \times 7\frac{1}{2} \times 15$.
5. $5\frac{3}{11} \times 3\frac{3}{4} \times 3\frac{2}{3} \times 5$.
6. $13\frac{1}{12} \times 8 \times \frac{7}{10}$.
7. $3\frac{1}{3} \times 1\frac{2}{5} \times \frac{13}{21} \times 3$.
8. $2\frac{4}{7} \times \frac{11}{12} \times 1\frac{3}{11} \times \frac{1}{2}$.
9. $2\frac{2}{9} \times 3\frac{3}{4} \times 1\frac{1}{30} \times 16$.
10. $4 \times \frac{7}{11} \times 2\frac{1}{2} \times 1\frac{9}{35}$.

Division by a fraction.

Suppose the question proposed—Find a sum of money such that $\frac{3}{11}$ of it may be equal to £3 10*s*. Since we have to find a sum which "multiplied" by $\frac{3}{11}$ may equal £3 10*s*., the operation is called division, and the question might shortly be stated, "Divide £3 10*s*. by $\frac{3}{11}$."

Since £3 10*s.* is 3 eleventh parts of required sum, $\frac{1}{3}$ of £3 10*s.* must be one eleventh part—therefore required sum = $\frac{11}{3}$ of £3 10*s.*

Hence the rule—To divide by a fraction, invert the fraction and proceed as in multiplication.

If the divisor be a mixed number, it must first be reduced to an improper fraction.

Example.—£21 17*s.* 6*d.* $\div 2\frac{1}{3}$ = £21 17*s.* 6*d.* $\div \frac{7}{3}$
= £21 17*s.* 6*d.* $\times \frac{3}{7}$ = £9 7*s.* 6*d.*

246.

	£	*s.*	*d.*	
1.	14	3	$5\frac{1}{4}$	$\div \frac{2}{5}$.
2.	37	12	$10\frac{1}{2}$	$\div \frac{2}{3}$.
3.	105	7	$6\frac{1}{4}$	$\div \frac{4}{7}$.
4.	807	16	3	$\div \frac{5}{6}$.
5.	512	2	$1\frac{1}{4}$	$\div \frac{7}{8}$.
6.	401	0	$3\frac{1}{2}$	$\div \frac{2}{9}$.
7.	73	15	$2\frac{3}{4}$	$\div \frac{5}{12}$.
8.	370	8	7	$\div \frac{3}{11}$.
9.	90	2	$6\frac{1}{4}$	$\div \frac{3}{8}$.
10.	47	16	3	$\div \frac{2}{7}$.

247.

1. 8oz. 12dwts. 21grs. $\div 3\frac{5}{6}$.
2. 7oz. 3dwts. 14 grs. $\div 2\frac{1}{8}$.
3. 11oz. 17dwts. 3grs. $\div 7\frac{1}{7}$.
4. 16lbs. 5 oz. 8dwts. $\div 5\frac{3}{8}$.
5. 7cwt. 3qrs. 15lbs. $\div 6\frac{3}{7}$.
6. 2qrs. 27lbs. 8oz. $\div 7\frac{3}{11}$.
7. 8 t. 7 cwt. 13 lbs. $\div 11\frac{2}{9}$.
8. 35yds. 1ft. $9\frac{1}{2}$in. $\div 15\frac{4}{7}$.
9. 6yds. 2ft. 10in. $\div 23\frac{4}{21}$.
10. 17 yds. $8\frac{1}{4}$ in. $\div 30\frac{9}{13}$.

Example.—Find the value of $5\frac{3}{4} \div 3\frac{1}{16}$.

$$5\frac{3}{4} \div 3\frac{1}{16} = \frac{23}{4} \div \frac{49}{16} = \frac{23}{\cancel{4}} \times \frac{\cancel{16}^{4}}{49} = \frac{92}{49} = 1\frac{43}{49}.$$

248.

1. $\frac{15}{28} \div \frac{5}{11}$.
2. $\frac{17}{35} \div \frac{8}{7}$.
3. $3\frac{4}{9} \div \frac{7}{12}$.
4. $8\frac{1}{4} \div \frac{11}{30}$.
5. $7\frac{3}{5} \div \frac{19}{21}$.
6. $4\frac{3}{7} \div \frac{13}{14}$.
7. $1\frac{3}{17} \div 3\frac{11}{13}$.
8. $\frac{34}{35} \div 3\frac{5}{21}$.
9. $5\frac{13}{15} \div 2\frac{2}{11}$.
10. $17\frac{1}{4} \div 1\frac{10}{13}$.
11. $5\frac{3}{8} \div \frac{9}{10}$.
12. $8 \div 7\frac{3}{11}$.
13. $57 \div 2\frac{14}{31}$.
14. $\frac{8}{35} \div 9\frac{1}{7}$.

15. $1\frac{2}{15} \div 10\frac{5}{13}$.
16. $\frac{19}{20} \div 1\frac{1}{19}$.
17. $42 \div 2\frac{11}{20}$.
18. $37\frac{1}{15} \div \frac{16}{69}$.
19. $17\frac{1}{64} \div 3\frac{3}{8}$.
20. $71\frac{7}{15} \div 5\frac{41}{15}$.

Reduction to Least Common Denominator.

Any set of fractions may always be reduced to equivalent fractions having the same denominator by the following method.

Find the L.C.M. of the denominators, divide it by the denominator of each fraction in turn, and multiply the numerator by the corresponding quotient.

Example.—Express with a common denominator the fractions $\frac{5}{9}$, $\frac{7}{8}$, $\frac{11}{12}$.

We find the L.C.M. of 9, 8, and 12 to be 72. $72 \div 9 = 8$, hence $\frac{5}{9}$ can be expressed with denr. 72 by multiplying both numr. and denr. by 8—*i.e.*, $\frac{5}{9} = \frac{40}{72}$. In the same way, $\frac{7}{8} = \frac{63}{72}$ and $\frac{11}{12} = \frac{66}{72}$. Hence the required fractions are $\frac{40}{72}$, $\frac{63}{72}$, $\frac{66}{72}$.

249.—Express with their least common denominator—

1. $\frac{5}{14}$, $\frac{17}{35}$, $\frac{11}{20}$, $\frac{3}{4}$.
2. $\frac{1}{2}$, $\frac{3}{16}$, $\frac{5}{36}$, $\frac{7}{12}$.
3. $\frac{2}{5}$, $\frac{5}{15}$, $\frac{4}{9}$, $\frac{13}{20}$.
4. $\frac{3}{11}$, $\frac{4}{5}$, $\frac{5}{7}$, $\frac{11}{13}$.
5. $\frac{5}{18}$, $\frac{20}{21}$, $\frac{14}{27}$, $\frac{5}{6}$.
6. $\frac{2}{3}$, $\frac{4}{15}$, $\frac{5}{21}$, $\frac{6}{7}$.

Addition of fractions.

If the denominators of the fractions to be added are the same, all that is necessary is to add the numerators.

Example. $\frac{5}{11} + \frac{3}{11} + \frac{8}{11} = \frac{16}{11} = 1\frac{5}{11}$.

If the denominators be different, the fractions must first be expressed with their least common denominator, and then the numerators added as below.

Example.—Add together $\frac{3}{14}$, $\frac{15}{28}$, $\frac{20}{21}$.

To find the L.C.D. we have 7)14, 28, 21.

4, 3.

therefore L.C.D $= 7 \times 4 \times 3 = 84$.

$$\frac{3}{14} + \frac{15}{28} + \frac{20}{21} = \frac{18 + 45 + 80}{84} = \frac{143}{84} = 1\frac{59}{84}.$$

250. Add together—

1. $\frac{8}{15}, \frac{6}{15}, \frac{7}{15}, \frac{2}{15}$.
2. $\frac{1}{10}, \frac{3}{10}, \frac{8}{10}, \frac{9}{10}$.
3. $\frac{2}{85}, \frac{16}{85}, \frac{20}{85}, \frac{9}{85}$.
4. $\frac{13}{29}, \frac{19}{29}, \frac{17}{29}, \frac{21}{29}$.
5. $\frac{11}{100}, \frac{27}{100}, \frac{31}{100}, \frac{18}{100}$.
6. $\frac{7}{30}, \frac{9}{30}, \frac{11}{30}, \frac{1}{30}$.
7. $\frac{10}{55}, \frac{25}{55}, \frac{48}{55}, \frac{13}{55}$.
8. $\frac{61}{99}, \frac{15}{99}, \frac{25}{99}, \frac{4}{99}$.
9. $\frac{101}{209}, \frac{87}{209}, \frac{28}{209}, \frac{19}{209}$.
10. $\frac{63}{397}, \frac{24}{397}, \frac{15}{397}, \frac{130}{397}$.

Find the value of—

251.

1. $\frac{3}{4} + \frac{5}{6} + \frac{11}{12}$.
2. $\frac{7}{9} + \frac{2}{3} + \frac{13}{18}$.
3. $\frac{1}{5} + \frac{7}{15} + \frac{5}{6}$.
4. $\frac{3}{14} + \frac{5}{7} + \frac{4}{21}$.
5. $\frac{20}{21} + \frac{4}{9} + \frac{1}{6} + \frac{2}{3}$.
6. $\frac{3}{10} + \frac{8}{15} + \frac{1}{3} + \frac{1}{2}$.
7. $\frac{5}{18} + \frac{7}{9} + \frac{3}{4} + \frac{5}{12}$.
8. $\frac{3}{11} + \frac{1}{2} + \frac{7}{33} + \frac{5}{6}$.
9. $\frac{2}{7} + \frac{5}{14} + \frac{7}{10} + \frac{3}{4}$.
10. $\frac{4}{9} + \frac{6}{7} + \frac{11}{21} + \frac{13}{14}$.

252.

1. $\frac{4}{11} + \frac{5}{33} + \frac{8}{33} + \frac{1}{4}$.
2. $\frac{5}{14} + \frac{13}{20} + \frac{15}{21} + \frac{4}{5}$.
3. $\frac{3}{8} + \frac{31}{40} + \frac{2}{15} + \frac{7}{16} + \frac{5}{12}$.
4. $\frac{1}{6} + \frac{13}{16} + \frac{5}{14} + \frac{7}{10} + \frac{2}{21}$.
5. $\frac{1}{8} + \frac{1}{9} + \frac{11}{48} + \frac{5}{18} + \frac{1}{6}$.
6. $\frac{3}{7} + \frac{4}{63} + \frac{5}{9} + \frac{13}{28} + \frac{1}{8}$.
7. $\frac{3}{50} + \frac{13}{20} + \frac{5}{16} + \frac{1}{4} + \frac{1}{2}$.
8. $\frac{17}{32} + \frac{3}{8} + \frac{7}{40} + \frac{1}{12} + \frac{7}{30}$.
9. $\frac{6}{49} + \frac{8}{21} + \frac{1}{7} + \frac{2}{3} + \frac{11}{14}$.
10. $\frac{3}{55} + \frac{7}{10} + \frac{21}{22} + \frac{4}{11} + \frac{3}{5}$.

Mixed numbers may be brought to improper fractions before addition, but it is much better to add the whole numbers and fractions separately.

Example.—Add together $5\frac{3}{4}$, $2\frac{7}{12}$, and $4\frac{11}{18}$.

$$5\tfrac{3}{4} + 2\tfrac{7}{12} + 4\tfrac{11}{18} = 11 + \frac{27+21+22}{36} = 11 + \tfrac{70}{36}$$
$$= 11 + 1\tfrac{34}{36} = 12\tfrac{34}{36} = 12\tfrac{17}{18}.$$

Find the sum of—

253.

1. $3\frac{2}{7}, 2\frac{1}{5}, 5\frac{5}{6}, 4\frac{1}{3}$.
2. $12\frac{3}{8}, 3\frac{7}{12}, 1\frac{2}{3}, 2\frac{1}{5}$.
3. $4\frac{11}{15}, \frac{7}{10}, 2\frac{1}{12}, 6\frac{13}{20}$.
4. $2\frac{5}{6}, 3\frac{1}{2}, 1\frac{8}{21}, \frac{11}{15}$.
5. $\frac{3}{16}, 5\frac{5}{14}, 1\frac{3}{28}, \frac{1}{8}$.
6. $2\frac{4}{7}, 12\frac{1}{3}, 5\frac{2}{11}, \frac{1}{6}$.
7. $13\frac{1}{2}, 2\frac{3}{32}, 5\frac{7}{24}, \frac{11}{12}$.
8. $7\frac{3}{10}, 12\frac{4}{5}, \frac{2}{35}, 3\frac{7}{20}$.
9. $3\frac{5}{24}, \frac{5}{16}, 4\frac{5}{9}, 1\frac{15}{36}$.
10. $2\frac{3}{11}, 7\frac{5}{9}, 1\frac{5}{66}, \frac{11}{18}$.

254.

1. $7\frac{2}{7} + 3\frac{5}{14} + \frac{7}{8} + 2\frac{3}{16}$.
2. $3\frac{1}{4} + 7\frac{5}{68} + \frac{16}{27} + 4\frac{3}{14}$.
3. $5\frac{4}{13} + 3\frac{1}{2} + \frac{21}{26} + 2\frac{7}{18}$.
4. $8\frac{2}{33} + 5\frac{2}{15} + \frac{9}{10} + 7\frac{3}{22}$.
5. $1\frac{3}{8} + 6\frac{7}{72} + 2\frac{5}{27} + \frac{4}{9}$.
6. $\frac{6}{7} + 4\frac{8}{11} + 3\frac{11}{70} + \frac{8}{35}$.
7. $2\frac{8}{15} + 3\frac{1}{5} + 6\frac{7}{25} + 1\frac{13}{100}$.
8. $4\frac{3}{17} + \frac{15}{34} + 3\frac{5}{16} + 1\frac{3}{8}$.
9. $6\frac{25}{96} + 2\frac{7}{60} + \frac{47}{48} + \frac{3}{16}$.
10. $7\frac{101}{108} + 6\frac{3}{10} + \frac{7}{18} + 1\frac{3}{14}$.

Subtraction of Fractions. Bring the fractions to a common denominator as for addition, and subtract the numerator of the second from that of the first.

Example. $\frac{7}{12} - \frac{3}{8} = \frac{14 - 9}{24} = \frac{5}{24}$.

Mixed numbers may either be brought to improper fractions, or we may work as in the following example.

Example. $15\frac{3}{4} - 7\frac{8}{9} = 8 + \frac{3}{4} - \frac{8}{9}$.

We cannot subtract $\frac{8}{9}$ from $\frac{3}{4}$, hence we must *borrow* 1 or $\frac{4}{4}$ from the whole number. We have then

$$7 + \frac{7}{4} - \frac{8}{9} = 7 + \frac{63 - 32}{36} = 7 + \frac{31}{36} \text{ or } 7\frac{31}{36}.$$

255.

1. $\frac{3}{4} - \frac{5}{16}$.
2. $\frac{7}{15} - \frac{4}{25}$.
3. $\frac{17}{18} - \frac{22}{27}$.
4. $\frac{13}{14} - \frac{27}{35}$.
5. $\frac{1}{18} - \frac{1}{20}$.
6. $\frac{4}{27} - \frac{1}{36}$.
7. $\frac{15}{16} - \frac{13}{14}$.
8. $\frac{11}{18} - \frac{5}{17}$.
9. $\frac{10}{51} - \frac{1}{17}$.
10. $\frac{20}{68} - \frac{19}{72}$.
11. $\frac{71}{72} - \frac{29}{99}$.
12. $\frac{13}{182} - \frac{1}{48}$.

256.

1. $5\frac{1}{2} - 2\frac{1}{3}$.
2. $6\frac{3}{7} - 1\frac{3}{10}$.
3. $12\frac{5}{14} - 3\frac{4}{21}$.
4. $2\frac{15}{32} - 2\frac{13}{48}$.
5. $7\frac{16}{35} - 6\frac{19}{55}$.
6. $17\frac{3}{20} - 5\frac{1}{16}$.
7. $35\frac{4}{25} - 21\frac{2}{15}$.
8. $75\frac{5}{36} - 12\frac{7}{60}$.
9. $100\frac{3}{28} - 51\frac{1}{21}$.
10. $83\frac{9}{10} - 35\frac{15}{32}$.
11. $17\frac{15}{77} - 12\frac{6}{35}$.
12. $23\frac{10}{13} - 20\frac{7}{65}$.

257.

1. $17\frac{1}{20} - 5\frac{13}{15}$.
2. $37\frac{7}{48} - 21\frac{17}{72}$.
3. $51\frac{1}{38} - \frac{4}{57}$.
4. $1\frac{3}{42} - \frac{7}{26}$.
5. $6\frac{11}{105} - 5\frac{55}{84}$.
6. $94\frac{1}{100} - 37\frac{1}{10}$.
7. $159\frac{3}{34} - 41\frac{47}{51}$.
8. $1\frac{7}{144} - \frac{62}{63}$.
9. $16\frac{12}{49} - 3\frac{47}{56}$.
10. $39\frac{19}{108} - 17\frac{123}{144}$.
11. $149\frac{151}{216} - 101\frac{251}{252}$.
12. $96\frac{15}{112} - 9\frac{17}{128}$.

Complex Fractions. A fractional expression in which either numerator or denominator, or both, are fractions, is called a complex fraction.

Such fractions may be at once expressed as cases of division by dividing numerator by denominator.

Example. $\frac{3\frac{1}{3}}{\frac{7}{8}} = 3\frac{1}{3} \div \frac{7}{8} = \frac{10}{3} \times \frac{8}{7} = \frac{80}{21} = 3\frac{17}{21}$.

258. Simplify—

1. $\frac{\frac{5}{12}}{\frac{25}{39}}$
2. $\frac{\frac{3}{16}}{\frac{21}{88}}$
3. $\frac{4\frac{2}{7}}{\frac{5}{11}}$
4. $\frac{5\frac{3}{8}}{3\frac{1}{12}}$
5. $\frac{\frac{9}{11}}{7\frac{1}{5}}$
6. $\frac{5\frac{7}{9}}{2\frac{2}{3}}$
7. $\frac{7\frac{3}{11}}{6\frac{2}{3}}$
8. $\frac{21}{1\frac{19}{100}}$
9. $\frac{9\frac{11}{16}}{186}$
10. $\frac{\frac{16}{33}}{5\frac{1}{11}}$
11. $\frac{6\frac{9}{44}}{7\frac{10}{20}}$
12. $\frac{\frac{15}{32}}{\frac{85}{128}}$
13. $\frac{6\frac{6}{11}}{12\frac{6}{7}}$
14. $\frac{51}{6\frac{7}{13}}$
15. $\frac{1}{47\frac{1}{50}}$
16. $\frac{12\frac{3}{11}}{108}$
17. $\frac{\frac{3}{100}}{49\frac{2}{25}}$
18. $\frac{1}{37\frac{5}{13}}$
19. $\frac{\frac{497}{1000}}{1\frac{17}{125}}$
20. $\frac{515}{10\frac{2}{41}}$

259.

1. $\frac{5\frac{3}{4} \times 7\frac{6}{23}}{40\frac{5}{16}}$
2. $\frac{\frac{3}{11} \text{ of } \frac{5}{9}}{3\frac{2}{3} \text{ of } 1\frac{4}{5}}$
3. $\frac{7\frac{1}{4} \times \frac{22}{23}}{\frac{11}{17} \text{ of } 3}$
4. $\frac{15\frac{3}{7} \times 2\frac{1}{12}}{2\frac{11}{35} \times 1\frac{5}{36}}$
5. $\frac{\frac{11}{26} \times \frac{17}{18}}{1\frac{5}{44} \times 3\frac{3}{16}}$
6. $\frac{1\frac{17}{18} \times \frac{5}{9}}{\frac{14}{15} \text{ of } 4\frac{1}{6}}$
7. $\frac{7\frac{13}{17} \text{ of } 3\frac{7}{9}}{19\frac{1}{5} \times \frac{1}{64}}$
8. $\frac{31\frac{1}{9}}{1\frac{1}{27} \times \frac{9}{11} \times \frac{3}{4}}$
9. $\frac{\frac{3}{4} \text{ of } \frac{5}{6} \text{ of } \frac{7}{8}}{\frac{9}{10} \text{ of } \frac{11}{12}}$
10. $\frac{1\frac{1}{5} \times 1\frac{1}{6} \times 1\frac{1}{7}}{1\frac{1}{8} \times 1\frac{1}{9}}$

11. $\dfrac{30\frac{1}{31} \times 5\frac{1}{4}}{\frac{5}{62}\text{ of }7\frac{7}{9}\text{ of }\frac{31}{82}}$

12. $\dfrac{2\frac{1}{2}\text{ of }3\frac{1}{3}\text{ of }4\frac{1}{4}}{5\frac{1}{5}\text{ of }119}$

13. $\dfrac{5\frac{3}{17} \times \frac{9}{11} \times \frac{57}{40}}{\frac{3}{21} \times 15\frac{1}{6} \times 74}$

14. $\dfrac{\frac{13}{95} \times \frac{133}{403}}{\frac{35}{57} \times 217}$

260.

1. $\dfrac{4\frac{1}{2} + \frac{5}{8}}{4\frac{1}{2} - \frac{5}{8}}$

2. $\dfrac{9\frac{3}{7} + 2\frac{1}{2}}{12\frac{3}{16}}$

3. $\dfrac{\frac{14}{15} + 1\frac{3}{5}}{\frac{5}{8} + 1\frac{5}{12}}$

4. $\dfrac{7\frac{3}{4} - 4\frac{2}{9}}{6\frac{1}{12} - 5\frac{3}{8}}$

5. $\dfrac{\frac{4}{27} - \frac{3}{32}}{7\frac{3}{14} - 6\frac{1}{2}}$

6. $\dfrac{5\frac{1}{2} + \frac{4}{5}}{3\frac{7}{8} + 1\frac{51}{80}}$

7. $\dfrac{14\frac{7}{10} + \frac{77}{100}}{15\frac{1}{2} - 1\frac{23}{25}}$

8. $\dfrac{\frac{1}{351}}{\frac{4}{9} + 3\frac{5}{7}}$

9. $\dfrac{\frac{1}{20} + \frac{1}{21}}{\frac{1}{20} - \frac{1}{21}}$

10. $\dfrac{\frac{4}{5} + 1\frac{1}{4}}{\frac{5}{6} + \frac{1}{5}}$

11. $\dfrac{13\frac{3}{11} - 12\frac{4}{9}}{5\frac{31}{33} - 1\frac{7}{12}}$

12. $\dfrac{4\frac{7}{20} - 3\frac{8}{15}}{3\frac{3}{16}}$

13. $\dfrac{7 - \frac{6}{15}}{\frac{5}{12} - \frac{1}{4}}$

14. $\dfrac{3\frac{19}{20} - 2\frac{16}{21}}{5\frac{27}{28}}$

15. $\dfrac{16\frac{3}{16} - 7}{4\frac{4}{5} + \frac{31}{40}}$

16. $\dfrac{\frac{11}{12} + \frac{23}{24}}{\frac{23}{24} - \frac{11}{12}}$

17. $\dfrac{14\frac{7}{15} + 5\frac{3}{5}}{3\frac{2}{3} - 2\frac{3}{4}}$

18. $\dfrac{\frac{100}{101} - \frac{99}{100}}{\frac{50}{51} - \frac{49}{50}}$

To find what fraction any quantity is of another of the same kind. Reduce both to the same denomination, and place the first for the numerator, the second for the denominator of the fraction.

Example.—What fraction is 3 t. 15 cwt. of 7 t. 5 cwt.?

3 t. 15 cwt. = 75 cwt.; 7 t. 5 cwt. = 145 cwt. Hence since 1 cwt. is the 145th part of 7 t. 5 cwt., 3 t. 15 cwt. = $\frac{75}{145} = \frac{15}{29}$.

261. Express—

1. 6*s.* 8*d.*	as a fraction of	£1.
2. 3*s.* 6*d.*	,,	7*s.* 7*d.*
3. £1 2*s.* 6*d.*	,,	£1 10*s.*
4. 3*s.* 6½*d.*	,,	3*s.* 11½*d.*
5. £3 7*s.* 6*d.*	,,	£1 6*s.* 3*d.*
6. £2 18*s.*	,,	£3 12*s.* 6*d.*
7. 15*s.* 11½*d.*	,,	£11 6*s.* 3¾*d.*
8. £32 5*s.* 3¾*d.*	,,	£34 8*s.* 4*d.*
9. 1 cwt. 23 lbs.	,,	4 cwt. 1 qr. 19 lbs.
10. 3 cwt. 1 qr. 21 lbs.	,,	1 ton.
11. 4 cwt. 1 qr. 7 lbs. 7 oz.	,,	9 cwt. 3 qrs. 13 lbs.
12. 1 lb. 1 oz. 15 dwts.	,,	8 oz. 10 dwts. 12 grs.
13. 5 f. 88 yds.	,,	10 miles.
14. 49 m. 2 f. 15 p.	,,	61 m. 1 f. 1 p.
15. 6 d. 13 h. 30 m.	,,	5 d. 21 h. 45 m.

Example.—Express $\frac{3}{8}$ of 1*s.* as a fraction of £1.

1*s.* = $\frac{1}{20}$ of £1, therefore $\frac{3}{8}$ of 1*s.* = $\frac{3}{8}$ of $\frac{1}{20}$ of £1 = $\frac{3}{160}$ of £1.

262. What fraction is—

1. $\frac{16}{17}$ of 1*d.* of £1.	*6.* $13\frac{1}{9}$ grs. of 1 oz.
2. $\frac{36}{37}$ of £1 of £20.	*7.* $15\frac{5}{13}$ min. of 1 h.
3. $\frac{3}{41}$ of 1*s.* of 18*s.*	*8.* $\frac{18}{19}$ in. of 1 yd.
4. $\frac{5}{8}$ of 1*d.* of 5*s.*	*9.* $1\frac{5}{7}$ qrts. of 1 bush.
5. $4\frac{3}{7}$ lbs. of 1 cwt.	*10.* $37\frac{5}{13}$ cu. in. of 1 cu. ft.

Example.—Express $\frac{1}{351}$ of £1 as a fraction of 1*d.*

£1 = 240*d.*, therefore $\frac{1}{351}$ of £1 = $\frac{1}{351}$ of 240*d.* = $\frac{240}{351}$ of 1*d.* = $\frac{80}{117}$ of 1*d.*

263. What fraction is

1. $\frac{5}{402}$ of 10*s.* of 1*d.*	*6.* $\frac{1}{1000}$ of 1 m. of 1 yd.
2. $\frac{1}{500}$ of £1 of 1*d.*	*7.* $\frac{5}{30432}$ of 1 f. of 1 in.
3. $\frac{3}{11}$ of £1 of 1*s.*	*8.* $\frac{3}{1120}$ of 1 a. of 1 p.
4. $\frac{1}{60}$ of 1*s.* of 1*f.*	*9.* $\frac{7}{1183}$ of 1 bush. of 1 pt.
5. $\frac{3}{77}$ of 1 t. of 1 lb.	*10.* $\frac{11}{2400}$ of 1 lb. Troy of 1 qr.

Example.—Express $\frac{3}{11}$ of £1 as a fraction of £2 10*s.*

£1 = $\frac{2}{5}$ of £2 10*s.*, therefore $\frac{3}{11}$ of £1 = $\frac{3}{11}$ of $\frac{2}{5}$ of £2 10*s.* = $\frac{6}{55}$ of £2 10*s.*

264. Express—

1.	$\frac{5}{8}$ of 1*s.* 6*d.*	as a fraction of	5*s.* 4*d.*
2.	$\frac{3}{40}$ of £1 10*s.*	,,	£1 5*s.*
3.	$3\frac{3}{7}$ of 2*s.* 4*d.*	,,	8*s.* 6*d.*
4.	$5\frac{3}{4}$ of 13*s.* 4*d.*	,,	£2 6*s.* 8*d.*
5.	$\frac{17}{20}$ of 5 yds. 1 ft.	,,	12 yds. 2 ft.
6.	$3\frac{1}{10}$ of 2 m. 3 f.	,,	5 f. 17 p.
7.	$\frac{13}{132}$ of 1 t. 5 cwt.	,,	19 cwt. 3 qrs.
8.	$\frac{15}{32}$ of 5 a. 3 r.	,,	6 a. 35 p.
9.	$\frac{5}{36}$ of 2 h. 21 m.	,,	5 h. 15 s.
10.	$\frac{25}{28}$ of 3 lbs. 2 oz. 16 dwts.	,,	5 lbs. 11 oz.

DECIMAL FRACTIONS.

According to the Arabic or decimal system of notation for whole numbers, the value of any figure in a number depends on its distance from the last or units figure. By an extension of the same notation we can represent fractions. A figure placed on the *right* of the units place is taken to represent so many tenths, hundredths, thousandths, &c., according as it stands in the first, second, third, &c., place after the units. Thus we may extend our numeration table as follows:—

&c.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.	Tenths.	Hundredths.	Thousandths.	Ten Thousandths.	Hundred Thousandths.	Millionths.	&c.

In order to indicate which figure of a number represents units, and so to define the value of every other figure in the number, a dot is placed after the units figure, and is called the decimal point.

Example—42·3065 means 4 tens 2 units 3 tenths 6 thousandths 5 ten thousandths.

Moving the decimal point one place to the right in any number multiplies the value of every figure in it by ten, for by so doing we change the units into tens, the tenths into units, the hundredths into tens, &c.

In the same way, we may multiply by 100, 1000, &c., by moving the decimal point two, three, &c., places to the right. Similarly, moving the decimal point to the left divides the number by 10, 100, 1000, &c., according to the number of places the point is moved.

Examples—

$81{\cdot}7061 \times 1000 = 81706{\cdot}1.$
$72{\cdot}3 \times 100 = 7230.$
$456{\cdot}7 \div 100 = 4{\cdot}567.$
$3{\cdot}72 \div 1000 = {\cdot}00372.$

265. Find the value of—

1.	$73{\cdot}2014 \times 100.$	*11.*	$301{\cdot}24 \div 100.$
2.	$3{\cdot}0561 \times 1000.$	*12.*	$5637{\cdot}3 \div 1000.$
3.	$\cdot728 \times 10.$	*13.*	$49{\cdot}7 \div 100.$
4.	$\cdot03261 \times 10000.$	*14.*	$5{\cdot}6321 \div 1000.$
5.	$6{\cdot}35902 \times 100.$	*15.*	$\cdot5637 \div 10.$
6.	$\cdot003 \times 1000.$	*16.*	$592 \div 100.$
7.	$\cdot07 \times 10000.$	*17.*	$73 \div 1000.$
8.	$31{\cdot}2 \times 100.$	*18.*	$\cdot52 \div 10000.$
9.	$\cdot0091 \times 1000.$	*19.*	$6500 \div 1000.$
10.	$35{\cdot}01 \times 100000.$	*20.*	$2{\cdot}3 \div 100000.$

To express in words any decimal, read the figures of the decimal as so many hundredths, thousandths, &c., according as the last figure is in the place of hundredths, thousandths, &c.

Example.—32·367 is in words thirty-two and three hundred and sixty-seven *thousandths*, for the 7 represents thousandths, and the 6 and 3 mean ten times and one hundred times respectively what would be their value if they stood in the third place, therefore the 6 means 6 tens of thousandths, and the 3 means 3 hundreds of thousandths.

266. Express in words—

1.	·7, ·07, ·007.	*6.*	5·6, 16·1, 103·9.
2.	·0003, ·03, ·003.	*7.*	32·03, 5·017, 16·0315.
3.	·17, ·35, ·56.	*8.*	50·05, 640·064, 13·031.
4.	·036, ·018, ·093.	*9.*	9·0001, 2·0037, ·5641.
5.	·0071, ·0362, ·123.	*10.*	290·02, 6·0003, 80·08.

To express any decimal as a vulgar fraction, write down for the numerator the figures of the decimal, and for the denominator 10, 100, 1000, &c., according as the decimal has one, two, three, &c., places, the number of 0's in the denominator being equal to the number of decimal places. This follows at once from what has been said above.

Examples. $\cdot031 = \frac{31}{1000}$. $15\cdot3079 = 15\frac{3079}{10000}$.

267. Express as vulgar fractions in their lowest terms—

1.	·8, ·5, ·6.	*6.*	·075, ·86, ·016.
2.	·25, ·75, ·05.	*7.*	·535, ·0325, ·128.
3.	·08. ·002, ·015.	*8.*	·0096, ·392, ·72.
4.	·55, ·008, ·125.	*9.*	·726, ·104, ·038.
5.	·0006, ·025, ·064.	*10.*	·012, ·0032, ·084.

268.

1.	5·625, 13·064.	*6.*	7·00224, 10·02525.
2.	51·112, 37·288.	*7.*	93·0364, 3·00625.
3.	106·1375, 8·208.	*8.*	42·15625, 19·1484.
4.	3·1875, 3·185.	*9.*	9·00148, 2·00984.
5.	12·1365, 71·435.	*10.*	7·00052, 6·17488.

Conversely, any fraction whose denominator is 10, 100, 1000, &c., may be written down as a decimal.

Example. $\frac{307}{10000} = \cdot0307$, the number of places in the decimal being equal to the number of 0's in the denominator of the fraction.

269. Express as decimals—

1. $\frac{8}{10}, \frac{7}{100}, \frac{9}{1000}$.
2. $\frac{23}{100}, \frac{51}{1000}, \frac{97}{100}$.
3. $\frac{7}{1000}, \frac{361}{1000}, \frac{291}{1000}$.
4. $\frac{147}{1000}, \frac{19}{100}, \frac{3}{10000}$.
5. $\frac{63}{10000}, \frac{149}{1000}, \frac{81}{100}$.
6. $3\frac{17}{1000}, 4\frac{101}{1000}, 12\frac{9}{100}$.
7. $\frac{57}{10}, \frac{369}{100}, \frac{6301}{100}$.
8. $\frac{4321}{10}, \frac{5938}{1000}, \frac{6251}{100}$.

Addition of decimals.

To add decimals write them underneath one another, so that the decimal points lie all in one line, then add up the different columns, beginning from the extreme right, and carry just as in addition of whole numbers. The decimal point is to be placed in the answer under the line of points in the sum.

Example. Add together 53·621, ·0037, 103·6, and 7·31.

Beginning with the fourth column, which represents *ten-thousandths*, we find in it only 7, which is accordingly set down in the answer. In the *thousandths* we have 3 and 1, which gives 4 *thousandths* in the answer. Similarly we have 3 *hundredths*. The *tenths* come to 15, or 1 unit and 5 *tenths*. Hence the 5 is put down and the 1 carried on to the column of units, &c.

53·621
·0037
103·6
7·31
164·5347

The process as explained above differs in no respect from that of addition of whole numbers, either in principle or working.

270.

1.	2.	3.
563·452	703·0005	·3056
31·037	2161·7539	4·2871
67·309	·6107	63·7904
426·654	5·3721	8·2369

4.	5.	6.
42·367	12·429	107·83
137·052	3·671	7316·41
3·781	261·032	4320·05
·326	7·674	81·37
15·637	1732·139	631·51

271.

1.	2.	3.
3·421	364·5	712·0037
15·53	8·342	61·32
·764	18·07	5·198
39·9	563·814	381·4002
6·85	23·9	69·5641
4.	5.	6.
12·217	68·4	2·34281
3·42861	5·3742	31·098
36·0309	31·58	7·7
·87	16·206	·9314
3·421	·8912	4·627

272. Add together—

1. 506·372, 31·21, 3·045, ·7631, 5·8.
2. ·76293, 3·427, 15·63, 8·234, ·2304.
3. ·73, 6·524, 13·71, 208·1, 35·623, 4·9.
4. 136·45, 13·645, 1·3645, ·13645, ·013645.
5. 304·8, 5·672, ·3205, 81·73, ·3069.
6. 12·03761, 4·3274, 31·9, 10·003, ·39·
7. 83·0375, 7·9241, 3·84, ·7, 631, 1·58.
8. 42·831, 156, 17·58, ·93741, 624·9001, 12·789.
9. 1·32761, 27·753, 6·91, ·3014, ·72506.
10. 304·6, 5·2371, 15·93, 2361·3, 827·612.

273. Find the value of—

1. 4·5 + 5·67 + 7·891 + 51·7242 + 18·1 + 24.
2. 1639·56 + 41·2 + 7801 + 56·402 + 81·7 + ·02.
3. 137·502 + ·3048 + ·00014 + 3·49816 + 8·3.

273. *(Continued.)*

4. 68·27 + 1·0563 + 4·563 + 171·8 + ·91 + 5.
5. 807 + ·807 + 80·7 + 8·07 + ·0807.
6. 12·348 + 6·71 + ·4386 + 603·2 + 53 + ·8035.
7. 20·02 + 2·2 + ·0202 + ·39 + 58·764 + ·83.
8. 5091 + 8·793 + 67·3 + 121·81 + 9·67 + 96·7.
9. 5·4 + ·54 + 540 + ·054 + 763·8 + 194.
10. ·00376 + 3·428 + 730·1 + 6·753 + 82·36.

Subtraction of decimals, like addition, follows the method used for whole numbers, the numbers being written so that their decimal points are in a line.

Example.—Subtract 36·7389 from 104·02.

Here we have written two 0's after the upper number to make the number of decimal places the same in both; these may, of course, be dispensed with.

104·0200	
36·7389	
67·2811	

Find the value of—

274.

1. 832·738 – 793·647.
2. 401·0036 – 82·3275.
3. 536·7428 – 178·0375.
4. 6·42007 – ·53108.
5. ·635849 – ·460851.
6. 1·00372 – ·87634.
7. 3·120034 – ·357812.
8. 72·60137 – 39·04257.
9. 5·830561 – 1·623752.
10. ·1003567 – ·0937183.

275.

1. 53·42 – 31·76521.
2. 3·072 – ·65426.
3. ·3041 – ·017681.
4. 81·0372 – 56·89.
5. 10·0003 – ·003.
6. 15 – 2·7563.
7. 8·23401 – 7·981.
8. 120·5 – 118·7634.
9. 15·423 – ·654217.
10. 34·1 – 28·10001.

276. Find the difference between—

1. 56·72 and 104·5.
2. 7·0037 and 15·987.
3. ·00365 and ·069412.
4. ·123406 and 4·012346.
5. 76·5 and 64·39871.
6. 53·247 and 135·1.
7. 1000 and ·0001.
8. ·36704 and 27.
9. ·7 and ·699872.
10. 3·42567 and ·342567.

Example.—Find the value of 3·45 − 1·237 + 7·6804 + 2·0036 − 9·6301.

3·45	1·237
7·6804	9·6301
2.0036	10·8671
13·1340	
10·8671	
2·2669	

Here we have added all the terms with a − sign before them, and subtracted the sum, viz. 10·8671, from the sum of the other terms, viz. 13·134.

277. Find the value of—

1. 5·307 − 4·27 − 1·0009 + 21·931 + 10·824.

2. 27·7 + 5·03671 − 10·7623 + 1·56 − 4·3524.

3. 19·4 − 3·46 + 5·7654 + 1·302 − ·30456.

4. ·374651 − ·0976 + ·8037 − ·3427 − ·105.

5. 3·40765 + ·3059 + 36·1 − 15·37 − 2·03217 − ·003721.

6. 591·6 − 320·7003 − 3·056 + 21·003761 − ·9375.

7. 4·7203 + 12·0234 − 8·35 + ·127362 − 4·3089 − 7·924 + 5·64937.

8. 141·9234 + 3·40972 + 81·627 − 12·1345 + 10·57982 − 2·6 − ·837451.

9. 63·4561 − 17·9318 − 3·243 − 28·037912 − 6·828 + ·0439 + 17·37067.

10. 14·32 + 27·73215 − 8·781 + 1·40257 − 5·3489 − ·736 + 13·5704.

Multiplication of decimals.

To find the product of two decimals, multiply as if they were whole numbers, and in the result mark off as many decimal places as there are in the two together.

273. *(Continued.)*

4. $68{\cdot}27 + 1{\cdot}0563 + 4{\cdot}563 + 171{\cdot}8 + {\cdot}91 + 5.$
5. $807 + {\cdot}807 + 80{\cdot}7 + 8{\cdot}07 + {\cdot}0807.$
6. $12{\cdot}348 + 6{\cdot}71 + {\cdot}4386 + 603{\cdot}2 + 53 + {\cdot}8035.$
7. $20{\cdot}02 + 2{\cdot}2 + {\cdot}0202 + {\cdot}39 + 58{\cdot}764 + {\cdot}83.$
8. $5091 + 8{\cdot}793 + 67{\cdot}3 + 121{\cdot}81 + 9{\cdot}67 + 96{\cdot}7.$
9. $5{\cdot}4 + {\cdot}54 + 540 + {\cdot}054 + 763{\cdot}8 + 194.$
10. $\cdot00376 + 3{\cdot}428 + 730{\cdot}1 + 6{\cdot}753 + 82{\cdot}36.$

Subtraction of decimals, like addition, follows the method used for whole numbers, the numbers being written so that their decimal points are in a line.

Example.—Subtract 36·7389 from 104·02.

Here we have written two 0's after the upper number to make the number of decimal places the same in both; these may, of course, be dispensed with.

Find the value of——

274.

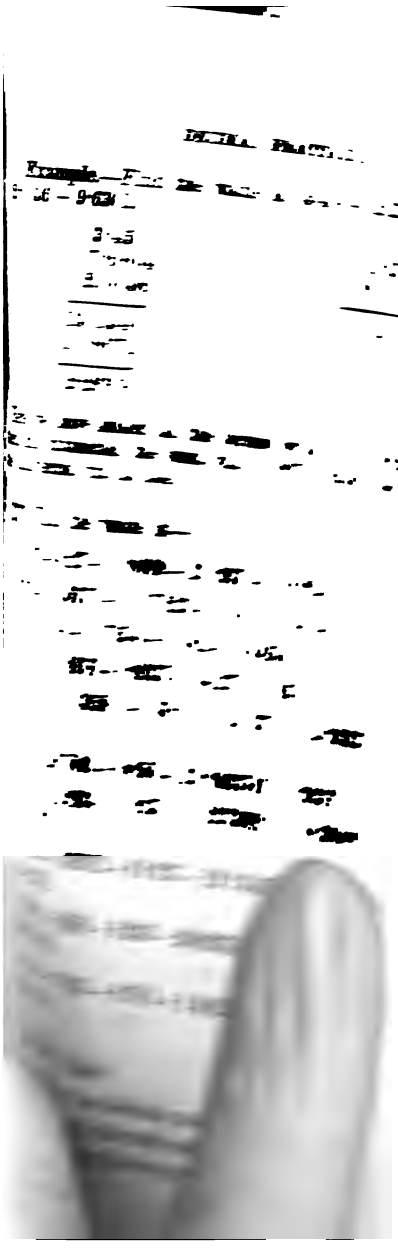
1. $832{\cdot}738 - 793{\cdot}647.$
2. $401{\cdot}0036 - 82{\cdot}3275.$
3. $536{\cdot}7428 - 178{\cdot}0375.$
4. $6{\cdot}42007 - {\cdot}53108.$
5. $\cdot635849 - {\cdot}460851.$
6. $1{\cdot}00372 - {\cdot}87634.$
7. $3{\cdot}120034 - {\cdot}357812.$
8. $72{\cdot}60137 - 39{\cdot}04257.$
9. $5{\cdot}830561 - 1{\cdot}623752.$
10. $\cdot1003567 - {\cdot}0937183.$

275.

1. $53{\cdot}42 - 31{\cdot}765$
2. $3{\cdot}072 - {\cdot}65436$
3. $\cdot3041 - {\cdot}01764$
4. $81{\cdot}0372 - 56{\cdot}$
5. $10{\cdot}0003 - {\cdot}00$
6. $15 - 2{\cdot}7563.$
7. $8{\cdot}23401 - 7{\cdot}$
8. $\cdot{}3 - {\cdot}65$
9. $\cdot{}$
10. $\cdot{}$

276. Find the differ

1. 56·72 and 104·5.
2. 7·0037 and 15·
3. ·00365 and
4. ·12340
5. 76·



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8(7·04

80
180

3.

3·7.
·2 ÷ 7·1.
52 ÷ 8·07.
95 ÷ 2·15.
4796 ÷ 35·6.
5·821 ÷ 7·03.
·0123 ÷ ·71.
30536 ÷ 1·36.
52·1688 ÷ 63·4.
·571868 ÷ 3·716.

284.

1.	182·25 ÷ 3·24.	*6.*	9·1425 ÷ 143·75.
2.	36·5062 ÷ ·0835.	*7.*	·61506 ÷ 38·25.
3.	·044826 ÷ ·0062.	*8.*	·0072 ÷ ·025.
4.	·33575 ÷ 4·25.	*9.*	3·0807 ÷ 945.
5.	·07372 ÷ ·00152.	*10.*	·0010353 ÷ ·0725.

Since the value of the figures of a decimal decreases very rapidly as they are farther from the decimal point, it is usual in practice only to carry our calculations to a certain number of decimal places, and reject all that come after.

In order to increase the accuracy of the last figure retained, it is usual to increase it by 1, if the first figure rejected be 5 or a greater number.

Example.—Divide 63·241 by 11·3 correct to three places.

As we only wish to retain three figures of the decimal and the fourth is 5, we change the 6 to 7, and write the result 5·597.

```
113)632·41 (5·5965
    565
    ---
     674
     565
     ---
     1091
     1017
     ----
      740
      678
      ---
       620
       565
       ---
        550
```

285. Find the value correct to six places of—

1.	·453 ÷ ·721.	*6.*	41 ÷ ·127.
2.	43·02 ÷ ·013.	*7.*	5 ÷ 7·31.
3.	·00371 ÷ ·023.	*8.*	·03279 ÷ 61·2.
4.	5·803 ÷ 6041.	*9.*	3801·7 ÷ 430·1.
5.	5016 ÷ 73·57.	*10.*	10·1 ÷ 19·7.

Since a vulgar fraction expresses the result of dividing the numerator by the denominator, we may reduce it to an equivalent decimal fraction by performing the division.

Example.—Express $\frac{5}{128}$ as a decimal.

$$
\begin{array}{r}
128)5\cdot00(\cdot0390625 \\
384 \\
\hline
1160 \\
1152 \\
\hline
800 \\
768 \\
\hline
320 \\
256 \\
\hline
640 \\
640
\end{array}
$$

286. Express as decimals—

1. $\frac{3}{4}$; $\frac{7}{8}$; $\frac{4}{5}$.
2. $\frac{5}{16}$; $\frac{3}{25}$; $\frac{113}{50}$.
3. $\frac{4}{125}$; $\frac{171}{400}$; $\frac{79}{20}$.
4. $\frac{13}{40}$; $\frac{551}{125}$; $\frac{11}{80}$.
5. $\frac{69}{250}$; $\frac{187}{400}$; $\frac{1117}{500}$.
6. $\frac{1129}{1250}$; $\frac{19}{32}$; $\frac{113}{160}$.
7. $\frac{31}{64}$; $\frac{371}{160}$; $\frac{78}{12500}$.
8. $\frac{721}{1600}$; $\frac{39}{7500}$; $\frac{621}{320}$.
9. $\frac{1}{128}$; $\frac{7623}{2500}$; $\frac{938}{625}$.
10. $\frac{231}{1280}$; $\frac{362}{3125}$; $\frac{721}{15625}$.

287. Express as decimals correct to six places—

1. $\frac{36}{171}$; $\frac{834}{585}$; $\frac{62}{81}$.
2. $\frac{5031}{907}$; $\frac{71}{101}$; $\frac{1}{785}$.
3. $\frac{4}{187}$; $\frac{180}{789}$; $\frac{536}{615}$.
4. $\frac{932}{1867}$; $\frac{19}{91}$; $\frac{1000}{891}$.
5. $\frac{4801}{695}$; $\frac{98}{101}$; $\frac{7}{193}$.
6. $\frac{31}{705}$; $\frac{6382}{441}$; $\frac{27}{527}$.

To express a decimal of one given quantity in terms of another, the same methods of multiplication and division are used as have been already given for reduction.

Example 1.—Express £3·457 in shillings.

$$
\begin{array}{r}
£ \\
3\cdot457 \\
20 \\
\hline
69\cdot140\ s.
\end{array}
$$

Example 2.—Express in shillings 3·528 *d.*

12)3·528 *d.*
·294 *s.*

Example 3.—Find the value of 7·315625 of a mile.

7·315625 m.
8
2·525000 furlongs.
40
21·000 poles.

Therefore we have 7 m. 2 f. 21 p.

Example 4.—Express 19*s.* 10½*d.* as a decimal of £1.

Here we begin by expressing ½*d.* as a decimal of 1*d.* and add on the 10*d.*, giving 10·5*d.*; this is reduced to a decimal of 1*s.* by dividing by 12, and the 19*s.* added; the result is then reduced to a decimal of £1 by dividing by 20.

4)2 *f.*
12)10·5*d.*
20)19·875 *s.*
·99375

Example 5.—Express 2*s.* 6¼*d.* as a decimal of 7*s.* 4*d.*

2*s.* 6¼*d.* = 121 farthings, and 7*s.* 4*d.* = 352 farthings. Hence 2*s.* 6¼*d.* is $\frac{121}{352}$ of 7*s.* 4*d.*, which fraction is reduced to a decimal in the usual way.

352)121·0(·34375
1056
1540
1408
1320
1056
2640
2464
1760
1760

288. Reduce—

1. 5·634285 pounds to shillings.
2. 3·75 pence to decimal of a pound.
3. 15·42375 shillings to farthings.
4. 12·84 farthings to decimal of a pound.
5. ·034213 of a mile to yards.
6. 29·7 inches to decimal of a mile.
7. 3·4279 tons to pounds.
8. 7 lbs. to decimal of a ton.
9. ·039625 of a day to minutes.
10. 36 minutes to decimal of a day.
11. 14·4 seconds to decimal of an hour.
12. 3·41635 lbs. Troy to grains.
13. 1·3045 of a pint to decimal of a gallon.
14. 15·0125 square yards to square inches.

Find the value of—

289.

1. ·75 of 1*s.*
2. ·125 of £1.
3. 3·25 of 1*s.*
4. ·0625 of 1*s.*
5. 3·15 of 1 ton.
6. 5·375 of 1 mile.
7. 7·875 of 1 dwt.
8. 9·35 of 1 hour.
9. 3·775 of 1 rood.
10. 5·95 of 1 ton.

290.

1. 3·425 of £1.
2. 2·91875 of £1.
3. ·6875 of 1*s.*
4. 17·30625 of 1 acre.
5. ·228125 of 1 ton.
6. 6·365 of 1 hour.
7. 12·5375 of 1 day.
8. ·053125 of £1.
9. 2·165625 of £1.
10. 3·234375 of 1 ton.

291.

1. 5·26 of £1.
2. 3·0352 of £1.
3. 7.3127 of 1 ton.
4. 5·2105 of 1 day.
5. ·7265 of £5.
6. 3·217 of 7*s.*
7. 13·7324 of 3 tons.
8. 17·61 of 1 acre.
9. ·00624 of 3 days.
10. 3·09712 of 7 acres.

292. Express as decimals of £1 correct to 5 places—

	£	s.	d.		£	s.	d.
1.	3	15	3	*6.*	5	10	$2\frac{1}{2}$
2.	2	12	6	*7.*	7	2	$8\frac{3}{4}$
3.	13	0	$4\frac{1}{2}$	*8.*		15	$6\frac{1}{4}$
4.		19	10	*9.*		1	$8\frac{1}{2}$
5.		3	$5\frac{1}{2}$	*10.*	31	4	$2\frac{3}{4}$

293. Express correctly to five places—

1.	5 cwt. 3 qrs. 4 lbs.	as a decimal of	1 ton.
2.	16 cwt. 1 qr. 7 lbs.	,,	1 cwt.
3.	8 oz. 17 dwts.	,,	1 lb.
4.	7 oz. 3 dwts. 16 grs.	,,	1 oz.
5.	8 h. 15 m. 31 s.	,,	1 day.
6.	35 m. 12 s.	,,	1 hour.
7.	8 f. 172 yds.	,,	1 mile.
8.	3 m. 5 f. 110 yds.	,,	1 mile.
9.	5 yds. 1 ft. 7 in.	,,	1 yard.
10.	18 yds. 1 ft.	,,	1 furlong.
11.	3 ft. $6\frac{1}{2}$ in.	,,	1 furlong.
12.	3 lbs. 5 oz.	,,	1 qr.

294. Express—

1.	3*s.* 4*d.*	as a decimal of	4*s.* 2*d.*
2.	1*s.* $10\frac{3}{4}$*d.*	,,	2*s.* 1*d*
3.	6*s.* 1*d.*	,,	10*s.* 5*d.*
4.	£3 0*s.* 1*d.*	,,	£4 3*s.* 4*d.*
5.	17 yds. 2 ft. 5 in.	,,	27 yds. 2 ft. 4 in.
6.	19 cwt.	,,	1 t. 11 cwt. 1 qr.
7.	3 qrs. 7 lbs.	,,	5 qrs. 20 lbs.
8.	2 a. 2 r. 31 p.	,,	1 a. 2 r. 10 p.
9.	2 h. 18 m. 37 s.	,,	20 m. 50 s.
10.	40 gals. 1 pt.	,,	50 gals.
11.	1 h. 13 m.	,,	8 h. 50 m.
12.	2 h. 11 s.	,,	2 hrs. 46 m. 40 s.

Recurring decimals. Let us try to express the fraction $\frac{173}{330}$ as a decimal. Proceeding as usual to divide 173 by 330, we obtain, after the third step of the division, the *same* remainder, viz. 80, as we had after the first, and it is clear that if we go on with the division we shall have the part of the work included between the brackets continually repeated, as also the figures 24 in the quotient. To indicate that the figures 24 continually recur, we write the answer $\cdot5\dot{2}\dot{4}$. Such a decimal is called a *recurring* decimal.

330)173·0(·524
1650
800
660
1400
1320
80

295. Express as recurring decimals—

1. $\frac{2}{3}$; $\frac{13}{9}$; $\frac{5}{6}$.
2. $\frac{7}{12}$; $\frac{11}{15}$; $\frac{13}{18}$.
3. $\frac{3}{7}$; $\frac{4}{11}$; $\frac{5}{36}$.
4. $\frac{91}{300}$; $3\frac{8}{45}$; $5\frac{1}{300}$.
5. $\frac{7}{150}$; $\frac{103}{110}$; $\frac{158}{495}$.
6. $\frac{103}{165}$; $\frac{107}{30000}$; $\frac{901}{1800}$.
7. $\frac{349}{1125}$; $\frac{43}{330}$; $\frac{27}{37}$.
8. $\frac{358}{909}$; $\frac{594}{1111}$; $\frac{4999}{16800}$.
9. $\frac{1627}{2250}$; $\frac{4421}{33300}$; $\frac{3257}{4500}$.
10. $\frac{10878}{33300}$; $\frac{10391}{19980}$; $\frac{2285}{6666}$.

To bring a recurring decimal to a vulgar fraction—

1. If all the figures of the decimal recur, write down for the numerator the figures of the decimal, and for the denominator as many 9's as there are figures.

2. If some of the figures recur and some do not, subtract the non-recurring figures from the whole; write the remainder for the numerator, and for the denominator write as many 9's as there are recurring figures, and after them as many 0's as there are non-recurring figures in the decimal.

Examples—

$$\cdot\dot{7}\dot{2} = \tfrac{72}{99} = \tfrac{8}{11}.$$

$$\cdot03\dot{6}\dot{4}\dot{5} = \frac{3645 - 36}{99000} = \tfrac{3609}{99000} = \tfrac{401}{11000}.$$

296. Express as vulgar fractions in their lowest terms—

1. $\cdot\dot{7}$; $\cdot\dot{6}$.	*5.* $\cdot\dot{7}20\dot{5}$; $\cdot\dot{0}69\dot{3}$.
2. $\cdot8\dot{7}$; $\cdot3\dot{6}$.	*6.* $\cdot4\dot{9}5\dot{0}$; $\cdot4\dot{2}9\dot{0}$.
3. $\cdot\dot{1}2\dot{6}$; $\cdot\dot{6}2\dot{1}$.	*7.* $\cdot\dot{0}0197\dot{9}$; $\cdot\dot{1}5384\dot{6}$.
4. $\cdot\dot{6}4\dot{5}$; $\cdot\dot{1}8\dot{5}$.	*8.* $\cdot\dot{1}42857$; $\cdot\dot{7}1385\dot{3}$.

297.

1. $\cdot4\dot{5}$; $\cdot3\dot{6}$.	*5.* $\cdot72\dot{2}\dot{4}$; $\cdot37\dot{2}\dot{5}$.
2. $\cdot11\dot{2}$; $\cdot72\dot{4}$.	*6.* $\cdot302\dot{6}2\dot{7}$; $\cdot537\dot{1}\dot{2}$.
3. $\cdot0\dot{0}2\dot{7}$; $\cdot1\dot{0}0\dot{3}$.	*7.* $\cdot01\dot{0}3\dot{6}$; $\cdot01\dot{7}32\dot{6}$.
4. $\cdot0\dot{0}3\dot{6}$; $\cdot513\dot{7}$.	*8.* $\cdot001\dot{1}2\dot{6}$; $\cdot00053\dot{4}$.

To add recurring decimals, the process of the following example is accurate enough in practice.

Example.—Add correctly to six places $715\cdot3\dot{8}$, $\cdot5\dot{0}\dot{3}$, $7\cdot36\dot{2}\dot{3}$, and $13\cdot32\dot{5}$.

All the recurring decimals have been carried out to *eight* places. Retaining only six places, we may write the result 36·579716.

$$\begin{array}{r} 15\cdot38888888 \\ \cdot50350350 \\ 7\cdot36232323 \\ 13\cdot325 \\ \hline 36\cdot57971561 \end{array}$$

A similar process will apply for subtraction.

298. Add together correctly to five places—

1. $341\cdot72\dot{3}$; $31\cdot0\dot{4}$; $5\cdot3\dot{6}\dot{2}$; $\cdot98\dot{7}\dot{6}$.

2. $30\cdot0\dot{3}$; $56\cdot\dot{7}$; $41\cdot8\dot{9}\dot{1}$; $21\cdot726$.

3. $63\cdot7045$; $15\cdot36\dot{7}\dot{2}$; $\cdot0\dot{0}3\dot{1}$; $6\cdot\dot{5}$; $7\cdot3\dot{2}$.

4. $540\cdot3015\dot{6}$; $\cdot3\dot{7}\dot{2}$; $\cdot49\dot{1}$; $16\cdot7234$; $\cdot\dot{4}$.

5. $63\cdot\dot{7}$; $\cdot4\dot{0}\dot{5}$; $7\cdot324\dot{5}\dot{6}$; $\cdot49\dot{3}$; $130\cdot8$.

6. $4\cdot\dot{1}998\dot{4}$; $15\cdot3\dot{7}086\dot{1}$; $5\cdot3\dot{1}\dot{9}$; $3\cdot7214$; $41\cdot4\dot{6}$.

7. $913\cdot\dot{4}$; $4\cdot36\dot{2}\dot{1}$; $16\cdot71\dot{2}$; $\cdot327$; $4\cdot56\dot{3}$; $631\cdot4056\dot{1}$; $\cdot731\dot{4}$.

8. $59\cdot\dot{3}$; $\cdot7\dot{4}\dot{2}$; $\cdot003\dot{6}$; $90\cdot30\dot{5}\dot{8}$; $6\cdot7243$; $43\cdot\dot{5}98\dot{1}$; $\cdot0376$.

299. Find the value, correct to five places, of—

1. $54\cdot3\dot{2}-17\cdot4\dot{7}3\dot{1}$.
2. $\cdot37\dot{2}1\dot{4}-\cdot036\dot{1}$.
3. $540\cdot\dot{6}\dot{3}-322\cdot7\dot{5}3\dot{0}$.
4. $6\cdot3\dot{7}2\dot{1}-\cdot4\dot{6}35\dot{8}$.
5. $43\cdot76\dot{0}\dot{5}-43\cdot7\dot{5}32\dot{1}$.
6. $1\cdot0\dot{0}37\dot{6}-\cdot9\dot{8}\dot{3}$.

Multiplication and division of recurring decimals may be approximately performed by carrying out the repeating figures a few places, but no general rule can be given for the number of places required. To ensure accuracy, the decimals must in most cases be reduced to vulgar fractions, the multiplications or divisions worked in fractions, and the result converted again to a decimal.

300.

1. Find the L.C.M. of 15, 20, 18, 30, 21.

2. Find the G.C.M. of 1073 and 925.

3. Simplify—

(1) $\frac{391}{414}\times\frac{117}{169}$.

(2) $3\frac{1}{2}+\frac{2}{5\frac{1}{4}+1\frac{1}{4}}$.

(3) $\frac{4}{11}\times 1\frac{2}{15}\times\frac{2}{7}\times 7\frac{4}{5}$.

4. Express as decimals $\frac{7}{16}$, $3\frac{7}{20}$, $4\frac{3}{8}$, and add these three decimals together.

5. Multiply 702·304 by 5·35.

6. Add together $3\frac{4}{9}$, $5\frac{7}{16}$, $\frac{11}{12}$, and $1\frac{5}{18}$.

7. Divide 30·75132 by 42·01, also by 420·1.

8. Express 1 guinea as a decimal of £1, also £1 as a decimal of 1 guinea.

9. Find the value of—

(1) £9 4*s.* $9\frac{1}{2}d.$ × $6\frac{5}{7}$.

(2) £100 ÷ $17\frac{3}{11}$.

10. Find the squares of $\frac{15}{17}$, $2\frac{1}{9}$, and $5\frac{1}{2}$.

11. Express $\frac{5}{6}$ as a fraction with denominator 3186, also $\frac{13}{19}$ with denominator 437.

12. Multiply the sum of $4\frac{5}{6}$ and $3\frac{4}{9}$ by their difference.

13. Find the value of—

(1) ·37 of 16*s.* 8*d.*

(2) 13·125 of £5.

(3) 4·372 of £100.

14. Express $3\frac{1}{9}$ of $1\frac{11}{16}$ as a decimal.

15. Express 1 lb. Troy as a fraction of 1 lb. Avoirdupois.

16. Find the product of 3·07, 30·7, and ·307.

17. Find the price of $75\frac{1}{2}$ shares in a mine at $82\frac{3}{8}$£ per share.

18. Divide £73 7*s.* $5\frac{3}{4}d.$ by $17\frac{3}{4}$.

19. What number must be added to $3\frac{1}{4}$ of $5\frac{5}{9}$ of $\frac{1}{20}$ to make $17\frac{1}{3}$?

20. A boy gave $\frac{1}{3}$ of a cake to his brother, and $\frac{1}{3}$ of the remainder to his sister; what fraction of the cake did he keep for himself?

21. Express ·45 of £1 as a decimal of £3 10*s.*

22. Find the value of—

$$5{\cdot}35 \times 15{\cdot}004 \times {\cdot}425 \times {\cdot}038.$$

23. Express as decimals $3\frac{5}{18}$ and $7\frac{7}{12}$.

24. Find the value of $4\dot{5}$ of £12.

25. Arrange in order of magnitude $\frac{8}{25}$, $\frac{1}{3}$, $\frac{15}{46}$.

26. Find the L.C.M. of 64, 108, 90, 15, 24, 72.

27. Simplify—

(1) $\frac{5}{9} + \frac{3\frac{1}{4}}{2\frac{3}{7} + 5\frac{1}{3}}$.

(2) $4\frac{5}{13} + 5\frac{1}{10}$ of $3\frac{4}{17} + \frac{19}{26}$.

28. Express $\frac{3}{15}$ of £1 7*s.* as a decimal of 1*s.*

29. Divide £265 5*s.* 5*d.* by $5\frac{1}{3}$.

30. Show that ·5327 is nearer in value to ·5326531 than is ·5326.

31. Find the value of 32·75 tons of coal at £1 10*s.* per ton.

32. Reduce to their lowest terms—

(1) $\frac{172}{1118}$; (2) $\frac{481}{2109}$.

33. Simplify—

(1) $\dfrac{2+\frac{2}{3}}{2-\frac{2}{3}} \div \dfrac{1-\frac{1}{3}}{1+\frac{1}{3}}$.

(2) $(8\frac{1}{5} - 4\frac{1}{4}) \div (\frac{5}{7} + \frac{3}{4} - \frac{1}{3})$.

34. Express as vulgar fractions in their lowest terms ·015; ·32075; 17·132.

35. If $\frac{3}{4}$ of a ship be worth £579, what is the value of the whole?

36. A metre is 39·3708 inches; express this as a decimal of a yard.

37. Express $\frac{7}{480}$ of £10 7*s.* as a decimal of 1*s.*

38. Find the value of—

(1) 2·0065 × ·00563.

(2) 2·0125 ÷ ·0035.

39. A sovereign measures ·86 in. in diameter; how far would a million reach if placed together in a straight line?

40. Express the difference between $5 \times \frac{3}{8}$£ and $5\frac{3}{8}$£ as a fraction of £5.

41. Divide the product of 6·799 and ·5214 by ·0156.

42. A litre is 1·76077 pints; how many gallons are there in 1000 litres?

43. Express as decimals $\frac{1}{111}$; $\frac{7}{440}$; $\frac{1}{81}$; $\frac{19}{120}$.

MENSURATION OF RECTANGLES.

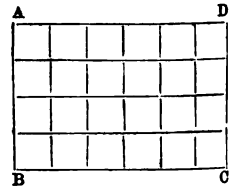
A *rectangle* is a figure bounded by four straight lines, of which the opposite ones are equal and all the angles are equal (they are called *right* angles).

For instance, the floor and walls of a room are rectangles.

A *square* is a rectangle all of whose sides are equal.

A *square foot* is the area of a square, each side of which is 1 ft. long. Similarly a square inch, a square yard, &c., may be defined.

Suppose we wish to find the area of a rectangle ABCD whose sides AB, BC contain 4 inches and 6 inches respectively; we may divide it into square inches by drawing lines across as in the figure, and since there are four rows each containing six squares, there must be altogether 4 × 6 or 24 square inches in the rectangle.



Hence we have the rule:—To find the area of any rectangle, multiply the numbers of units of length—inches, feet, &c.—in two adjacent sides; the result will be the number of units of area—square inches, feet, &c.—which the rectangle contains.

It is incorrect and absurd to talk of multiplying two lengths together, but if we take the terms length, breadth, area, to mean only the *abstract numbers* measuring them, we may shortly state the above rule thus—

$$\text{Area} = \text{length} \times \text{breadth}.$$

We can now see *why* 144 square inches make a square foot, for a square foot is a rectangle each side of which is 12 in. long; hence it must contain 12 × 12, or 144 square inches. For a similar reason a square yard is 3 × 3, or 9 square feet.

Example.—Find the area of the floor of a room 12 ft. 3 in. long and 10 ft. 6 in. wide. 12 ft. 3 in. = 147 in.; 10 ft. 6 in. = 126 in.

Reducing the lengths of the two sides to inches and multiplying, we have the area in square inches, which are reduced to feet and yards by dividing by 144 and 9.

$$\begin{array}{r} 147 \\ 126 \\ \hline 882 \\ 294 \\ 147 \\ \hline \end{array}$$

12)18522 sq. in.

12)1543 – 6 }
9)128 – 7 } 90 sq. in.

14 sq. yds. 2 sq. ft.

We might have worked more shortly by fractions, thus—

12 ft. 3 in. = $12\frac{1}{4} = \frac{49}{4}$ ft., 10 ft. 6 in. = $10\frac{1}{2} = \frac{21}{2}$ ft.

$\frac{49}{4} \times \frac{21}{2} = \frac{1029}{080} = 128\frac{5}{8}$ sq. ft. = 128 sq. ft. 90 sq. in.

= 14 sq. yds. 2 sq. ft. 90. sq. in.

301.—Find the area of rectangles measuring—

1. 2 ft. 6 in. by 3 ft. 6 in.
2. 3 yds. 1 ft. „ 7 yds. 2 ft.
3. 5 ft. 7 in. „ 2 ft. 9 in.
4. 12 ft. 6 in. „ 20 ft.
5. 15 ft. 2 in. „ 10 ft. 4 in.
6. 3 yds. 1 ft. „ 5 yds. 2 ft. 6 in.

7. A room measures 21 ft. long, 15 ft. 6 in. wide, and 12 ft. 3 in. high; find (1) the area of its floor, (2) the area of its end wall, (3) the area of its side wall.

8. A rectangular field measures 23 poles by 25 poles; find its area.

9. A field is 15 chains long and 7 wide; how many acres and roods does it contain? (10 square chains = 1 acre.)

10. A sheet of paper measures $7\frac{1}{4}$ in. by $10\frac{1}{2}$ in.; find the area of a quire (24 sheets) of it, considering both sides of each sheet.

Since the product of the length and breadth of a rectangle gives the area, the area divided by either of these will give the other.

Example.—A piece of cloth 7 yds. 1 ft. long contains 9 sq. yds. 7 sq. ft.; what is its breadth?

9 sq. yds. 7 sq. ft. = 88 sq. ft. 7 yds. 1 ft. = 22 ft.
Hence breadth = $\frac{88}{22}$ ft. = 4 ft. = 1 yd. 1 ft.

302.—Find the other side of the following rectangles—

1. Area = 9 sq. yds. 4 sq. ft.; length = 5 yds. 2 ft.

2. Area = 7 sq. ft. 18 sq. in; length = 3 ft. 2 in.

3. Area = 19 sq. yds. 3 sq. ft.; breadth = 4 yds.

4. Area = 25 sq. ft. 80 sq. in; breadth = 3 ft. 4 in.

5. Area = 133 sq. ft. 34 in; breadth = 8 ft. 10 in.

6. How many yards of carpet 2 ft. 3 in. wide will be required for the floor of a room containing 22 sq. yds. 4 sq. ft. 72 sq. in.?

7. A rectangular field contains 2 a. 2 r. 8 p.; one side is 17 p. long, find the length of the other?

8. A rectangular piece of ground contains 7 p.; one side is 20 yds. 6 in., find the other.

9. The four walls of a square room contain 701 sq. ft. 72 sq. in., the height of the room is 11 ft. 6 in.; find its length.

10. What length of matting 3 ft. 2 in. wide will be required to cover the floor of a room 19 ft. long and 15 ft. 8 in. wide?

11. A field of 7 a. 1 r. is 319 yds. long; find its breadth.

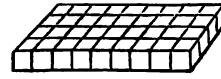
A *rectangular solid* is a solid bounded by six rectangles; for instance, a brick, &c.

When all the sides are squares, and consequently all the edges equal, the solid is called a *cube*.

A *cubic foot* is the solid contents of a cube each of

whose edges is one foot long. Similarly a cubic inch, yard, &c., may be defined.

Suppose we wish to find how many cubic inches a brick contains which measures 9 in. long, 4 in. broad, and 3 in. thick, we may reason as follows. Suppose the brick divided into three slices each 1 in. thick, then each slice might be divided into cubic inches as in the figure, one cubic inch standing on each square inch of the base, hence there will be in each slice 9×4 cubic inches, and therefore in the whole brick $9 \times 4 \times 3$ cubic inches. Hence we have the rule:—To find the solid contents of a rectangular solid, multiply together the units of length—feet, inches, &c.—in its length, breadth, and thickness; the result will be the number of units of solidity—cubic feet, cubic inches, &c.—which the solid contains. We may, with the understanding given above, when treating of surface, express this rule shortly—



Solid contents = length × breadth × thickness.

The solid contents divided by the product of any two of the dimensions, *i.e.*, the number of square units in one face, will give the third dimension.

303.—Find the cubical contents of rectangular blocks measuring—

1.	3 ft. 2 in.	long,	4 ft. 3 in.	broad,	1 ft. 2 in.	thick.
2.	8 yds. 1 ft.	,,	4 yds. 2 ft.	,,	2 yds.	,,
3.	7 ft. 6 in.	,,	8 ft. 3 in.	,,	3 ft. 6 in.	,,
4.	15 ft. 8 in.	,,	11 ft. 6 in.	,,	5 ft. 4 in.	,,
5.	21 ft. 6 in.	,,	15 ft.	,,	6 ft. 3 in.	,,

6. How many cubic feet of air does a room contain which is 17 ft. 3 in. long, 15 ft. 4 in. wide, and 12 ft. high?

7. How much water does a canal hold which is 1 mile long, 6 ft. 3 in. deep, and 20 ft. 6 in. wide?

8. A cistern has a square base, each side of which is 3 ft. 2 in. long; its depth is 2 ft. 5 in.; find its contents.

9. A cubical block of stone has each edge 4 ft. 8 in. long; calculate its contents.

10. A beam of timber 30 ft. 5 in. long, is 1 ft. 7 in. wide, and 1 ft. 1 in. thick; how much wood does it contain?

304.

1. A cistern is 3 ft. 4 in. long, 2 ft. 3 in. wide, and contains 11 cu. ft. 432 cu. in. of water; what is its depth?

2. The base of a block of stone contains 13 sq. ft. 38 sq. in., and its cubical contents are 44 ft. 228 in.; find its height?

3. In digging a ditch 5 ft. 2 in. wide and 2 ft. 8 in. deep, 82 cu. yds. 18 cu. ft. of earth was taken out: how long was the ditch?

4. A beam of timber is 1 ft. 4 in. wide, 8 in. thick, and contains 19 cu. ft. 192 cu. in.; what is its length?

5. A wall is covered with plaster $\frac{3}{4}$ in. thick; how large an area will 1 cu. ft. of plaster cover?

SIMPLE PROPORTION.

When we compare two quantities of the same kind by considering what multiple or part the one is of the other, we are said to find their "ratio." We obtain then a proper measure of the ratio of two quantities by finding *what fraction the one is of the other.* Thus the ratio of 15*s.* to 17*s.* 6*d.* is measured by the fraction $\frac{6}{7}$, since 15*s.* is $\frac{6}{7}$ of 17*s.* 6*d.*

When the first of four quantities has to the second the same ratio as the third has to the fourth, they are said to form a *proportion.*

Thus £1 10*s.*, £6; 3 in., 1 ft. form a proportion; for £1 10*s.* is $\frac{1}{4}$ of £6, and 3 in. $\frac{1}{4}$ of 1 ft. The proportion would be written—

£1 10*s.* : £6 : : 3 in. : 1 ft.

and would be read "*as* £1 10*s.* *is to* £6, *so is* 3 in. *to* 1 ft."

When the first three terms of a proportion are given, the fourth can be found as follows:—Reduce (if necessary) the first two terms to the same denomination, then divide the third term by the number in the first place, and multiply by the number in the second.

Thus suppose the first three terms are—

1 cwt. 3 qrs. : 2 qrs. : : £3 10*s.*

We are to find a sum of money which shall have to £3 10*s.* the same ratio that 2 qrs. has to 1 cwt. 3 qrs., *i.e.*, as 2 qrs. has to 7 qrs. Now 2 qrs. is $\frac{2}{7}$ of 7 qrs., therefore the required sum must be $\frac{2}{7}$ of £3 10*s.*, to find which we divide by 7 and multiply by 2, according to the above rule.

The first two terms of a proportion must always be of the same kind, as also the last two, for only quantities of the same kind can have a ratio to one another.

Example.—If 2 yds. 1 qr. of silk cost 10*s.* 8$\frac{1}{4}$*d.*, what will 1 yd. 3 qrs. cost?

It is clear that 2 yds. 1 qr. must have the same ratio to 1 yd. 3 qrs. as the *price* of the former to that of the latter.

Hence we have the proportion—

2 yds. 1 qr. : 1 yd. 3 qrs. : : 10*s.* 8$\frac{1}{4}$*d.* : Answer.

The working of the sum is given below.

yds.	qr.		yd.	qrs.		*s.*	*d.*
2	1	:	1	3	: :	10	8$\frac{1}{4}$
4			4				7
9			7			9)3 14	9$\frac{3}{4}$
						8	3$\frac{3}{4}$

Example.—If a train takes 2 h. 18 m. to make a certain journey at the rate of 30 miles an hour, how long will it take if it only goes 23 miles an hour?

The time taken by the journey will be *longer* in the same ratio as the number of miles per hour is less, and we shall have the proportion—

$$23 : 30 :: \begin{array}{r} \text{h. m.} \\ 2\ 18 \\ 3 \\ \hline 6\ 54 \\ 10 \\ \hline \text{h.} \end{array}$$

$$23)69\ 0\ (3 \text{ Ans.}$$
$$69$$

This example is a case of *inverse proportion.*

The following rule may be given for stating any proportion sum :—Place the single term of the same kind as the answer last. Of the other two, place the greater or less in the second place, according as it is evident that the answer must be greater or less than the third term.

It is often convenient, after reducing the terms, to write the answer in a fractional form, the numerator being the product of the second and third terms, and the denominator the first term, thus :—

Example.—If 63 yards of linen cost £4 18*s.*, how much can be bought for £1 15*s.*?

$$\begin{array}{rcl} \text{£ } s. & \text{£ } s. & \\ 4\ 18 & 1\ 15 & :: \ 63 \text{ yds.} \\ 20 & 20 & \\ \hline 98 & 35 & \end{array}$$

$$\text{Ans.} = \frac{63 \times 35}{98} \text{ yds.} = \tfrac{45}{2} \text{ yds.} = 22\tfrac{1}{2} \text{ yds.}$$

In reducing a fraction like the above, we may divide the denominator and *either* factor of the numerator by any number. Hence the answer to a rule of three sum will not be altered by dividing the first term and *either* of the other two by any number. This process of "cancelling" often shortens the work.

305.

1. If ten chickens cost £1 6*s.* 8*d.*, what will 13 cost?

2. If I give £1 11*s.* 6*d.* for 12 lbs. of tea, what will be the cost of 17 lbs.

3. Find the value of 18 sheep if 21 are worth £43 11*s.* 6*d.*

4. If 25 tons of iron cost £137 12*s.* 1*d.*, how much will 30 tons cost?

5. If 53 acres of land are let for £238 10*s.*, what should be the rent of 21 acres?

6. If the wages of 24 men for a week are £28 1*s.*, how much will 32 earn in the same time?

7. If I pay £1 2*s.* 6*d.* for travelling by rail 135 miles, what should be my fare for a journey of 216 miles?

8. Find the value of 91 things at £16 8*s.* 1½*d.* for 63.

9. If 51 tons of coal cost £66 14*s.* 6*d.*, find the price of 221 tons.

10. How much does a man earn in a year of 52 weeks, who earns £10 11*s.* 2*d.* in 7 weeks?

306.

1. If 13 chests of tea weigh 16 cwt. 1 qr. 13 lbs., how much do 29 weigh?

2. A railway train travels 282 m. 3 f. in 9 hours: how far will it travel in 15 hours?

3. If I buy 9 cwt. 12 lbs. of sugar for £17, how much could I buy for £12?

4. If 13 yds. 2 qrs. of linen cost 15*s.*, how much can be bought for 10*s.*?

5. If 19 pieces of cloth contain 793 yds. 1 qr., how much is there in 15 pieces?

6. If 27 casks of beer contain 112 gals. 2 qrts., how much will 39 casks hold?

The time taken by the journey will be *longer* in the same ratio as the number of miles per hour is less, and we shall have the proportion—

$$23 : 30 :: \begin{array}{r} \text{h. m.} \\ 2\ 18 \\ 3 \\ \hline 6\ 54 \\ 10 \\ \hline 23)69\ 0\ \text{h.} \\ 69 \end{array} \quad (3 \text{ Ans.}$$

This example is a case of *inverse proportion*.

The following rule may be given for stating any proportion sum :—Place the single term of the same kind as the answer last. Of the other two, place the greater or less in the second place, according as it is evident that the answer must be greater or less than the third term.

It is often convenient, after reducing the terms, to write the answer in a fractional form, the numerator being the product of the second and third terms, and the denominator the first term, thus :—

Example.—If 63 yards of linen cost £4 18*s.*, how many can be bought for £1 15*s.*?

$$\begin{array}{rcl} \text{£ } s. & & \text{£ } s. \\ 4\ 18 & : & 1\ 15 \\ 20 & & 20 \\ \hline 98 & & 35 \end{array} :: 63 \text{ yds.}$$

$$\text{Ans.} = \frac{63 \times 35}{98} \text{ yds.} = \tfrac{45}{2} \text{ yds.} = 22\tfrac{1}{2} \text{ yds.}$$

In reducing a fraction like the a[bove] [we] may div[ide] the denominator and *either* fact[or of the] numerator by any number. Hence the answ[er] will not be altered by divi[ding] of the other two by "cancelling" often s[aves]

305.

1. If ten chickens cost £1 6*s.* 8*d.*, what will 13 cost?
2. If I give £1 11*s.* 6*d.* for 12 lbs. of tea, what will be the cost of 17 lbs.
3. Find the value of 18 sheep if 21 are worth £43 11*s.* 6*d.*
4. If 25 tons of iron cost £137 12*s.* 1*d.*, how much will 30 tons cost?
5. If 53 acres of land are let for £228 10*s.*, what should be the rent of 21 acres?
6. If the wages of 24 men for a week are £[illegible] 2*s.*, how much will 25 men in the same time?
7. If I pay £1 2*s.* 6*d.* for travelling by rail [illegible] miles, what should be my fare for a journey of 216 miles?
8. Find the value of 91 things at £18 5*s.* [illegible] for 63.
9. If 81 lbs. of coal cost £66 14*s.* 6*d.*, [illegible] price of 121 lbs.
10. How much does a man earn in a year [illegible] weeks, who earns £[illegible] 7*s.* in 7 weeks?

306.

1. If 15 sheep (of an average [illegible] lbs. 1 qr. [illegible] lbs.), how [illegible]?
2. A railway [illegible] 200 in 24 hr. [illegible], how [illegible]?
3. If 3 lbs. [illegible] of sugar for £[illegible], [illegible]?
4. [illegible] of [illegible] cost [illegible]

5. How much coffee at 2*s.* per lb. is equal in value to 32 lbs. of tea at 2*s.* 6*d.* per lb.?

6. How much silk at 7*s.* 4*d.* per yd. should be given in exchange for 12 yds. at 8*s.* 3*d.* per yd.?

7. A railway train going at the rate of 26 m. 7 f. an hour, makes a journey in 5 h. 36 m.; how long would it take if it travelled at the rate of 32 m. 2 f. an hour?

8. How long would it take a man walking 3 m. 4 f. an hour to make a journey, which, by driving at 8 m. 6 f. an hour, he does in 10 h. 20 m.?

9. How much land worth £70 14*s.* an acre must be given in exchange for 118 a. 27 p. worth £151 10*s.* an acre?

310.

1. If 2 qrs. 4 lbs. of sugar cost 17*s.* 6*d.*, how much can be bought for £1 12*s.* 8*d.*?

2. How much cloth can be bought for £2 12*s.* 3*d.* if 13 yds. 1 qr. cost £3 12*s.* 10½*d.*?

3. If 7 lbs. 8 oz. of tea cost £1 8*s.* 1½*d.*, how much can be bought for 12*s.* 2¼*d.*?

4. If a piece of iron tube 3 ft. 2 in. long cost 3s. 11½*d.*, what length can be bought for 10*s.* 8¾*d.*?

5. How much beef can be bought for £1 12*s.* 3¾*d.* if 2 st. 8 lbs. costs £1 4*s.* 9*d.*?

6. If 12 qrs. 3 bush. of wheat costs £27 0*s.* 4½*d.*, how much can be bought for £19 13*s.*?

7. If gas costs 5*s.* 10*d.* per 1000 cubic feet, how much must I have burnt if my gas bill is £1 16*s.* 9*d.*?

8. A man earns £3 10*s.* 10*d.* in 15 days 3 hours, working 10 hours a day; how long will it take him to earn £4 7*s.* 6*d.*?

9. A farm of 54 a. 1 r. is rented for £151 11*s.* a year; at the same rate the rent of another farm is £281 1*s.*; how large is the latter farm?

10. If 51 t. 7 cwt. of iron costs £436 9*s.* 6*d.*, how much can be bought for £668 2*s.*?

COMPOUND PROPORTION.

Suppose the question proposed—

"If 7 men earn £12 5*s.* for 10 days' work, how much will 12 men earn for 6 days' work?"

We might solve this by two applications of simple proportion. First find how much 7 men would earn in 6 days. The question will stand—

If 7 men earn 245s. in 10 days, how much will they earn in 6 days?

$$10 : 6 :: 245s.$$

Therefore they earn $\frac{245 \times 6}{10}s.$

We may now find how much 12 men would earn by asking the question—

If 7 men earn $\frac{245 \times 6}{10}s.$ *in 6 days, how much will 12 men earn in the same time?*

$$7 : 12 :: \frac{245 \times 6}{10}.$$

They earn therefore $\frac{245 \times 6 \times 12}{10 \times 7} = 252s. = £12\ 12s.$

We shall obtain this result more simply by combining the above two statements into one, thus—

$$\left.\begin{matrix} 10 : 6 \\ 7 : 12 \end{matrix}\right\} :: 245s.$$

to obtain which we place last the single term of the same kind as the answer, and then arrange the other terms by reading the original question *twice* as above, first leaving out of consideration the number of men, then the number of days.

The answer is $\frac{245 \times 6 \times 12}{10 \times 7}s. = £12\ 12s.,$

or it is obtained by multiplying the last term by the product of the second terms, and dividing by the product of the first terms. The terms in each line must be reduced to the same denomination, just as in simple proportion.

311.

1. If I walk 105 miles in 5 days, walking 6 hours a day, how far shall I walk in 7 days, walking 4 hours a day?

2. If a man earns £1 17*s.* 11*d.* for 13 days' work, working 7 hours a day, how much will he earn in 10 days of 8 hours each?

3. If £8 19*s.* 8*d.* pays 11 men for 4 days, how much will be required to pay 9 men for 12 days' work?

4. If 80 tons be carried 35 miles for £11 13*s.* 4*d.*, what should the carriage of 91 tons a distance of 50 miles cost?

5. If 16 men in 3 days mow 36 acres, how many men will be required to mow 78 acres in 8 days?

6. If 20 horses can be kept 21 days for £45 10*s.*, how much will it cost to keep 17 horses for 13 days?

7. If 8 horses plough 12 a. 3 r. in 3 days, how many days will 24 horses take to plough 89 a. 1 r.?

8. If a man can walk 85 miles in 4 days, walking $8\frac{1}{2}$ hours a day, how many days will it take him to walk 100 miles, walking 5 hours a day?

9. If it costs £12 8*s.* to carpet a room 15 ft. 6 in. long and 12 ft. broad, how much should the carpet of another room cost which is 18 ft. 4 in. long and 13 ft. 6 in. broad?

10. If 51 men earn £131 2*s.* 3*d.* for 15 days' work, how many men may be paid with £69 14*s.* for 24 days' work?

11. If a field 9 ch. 60 lks. long and 5 ch. 50 lks. wide costs £253, what should be the price of another 8 ch. long and 7 ch. 20 lks. wide?

12. A piece of cloth 17 yds. long and $1\frac{1}{4}$ yds. wide weighs 7 lbs. 4 oz.; how much will a piece of the same kind weigh which is $21\frac{1}{4}$ yds. long and $\frac{3}{4}$ yd. wide?

13. 1800 soldiers consume 648 qrs. of wheat in 315 days; how long will 1152 qrs. last an army of 24,000 men?

14. A party of 12 persons spends £230 in 8 months; how long will £295 16*s.* 8*d.* last a party of 20 persons spending at the same rate?

15. 8 cottages cost £1920 and are let at £15 a year rent each; what should be the rent of each of 9 cottages which cost £1500?

16. 50 men do a piece of work in 14 days, working 7 hours a day; how many hours a day would 35 men have to work to do the same work in 24 days?

17. If the interest of £452 10*s.* for 8 months be £9 1*s.*, what should be the interest on £840 for 9 months at the same rate?

18. If a capital of £1050 produces in trade in 2 years £189, how much should £5352 10*s.* produce in 3 years?

19. If 341 tiles be required to pave a floor 15 ft. 6 in. long and 5 ft. 6 in. wide, how many will be required for a floor 14 ft. long and 7 ft. 6 in. wide?

20. If 30 men working $7\frac{1}{2}$ hours a day earn £73 2*s.* 6*d.* in 12 days, what should be the wages of 45 men working 7 hours a day?

21. 10 men dig a ditch 145 yds. long, 4 ft. wide, and $4\frac{1}{2}$ ft. deep in 2 days; how many men will be required to dig a ditch 116 yds. long, $4\frac{1}{2}$ ft. wide, and $3\frac{1}{2}$ ft. deep in the same time?

22. If £24 14*s.* pay 12 men for 13 days' work, how many men will £47 10*s.* pay for 15 days' work?

23. If a profit of £792 be made in 4 years with a capital of £1320, what capital will be required to make a profit of £1500 in two years?

PROPORTIONAL PARTS.

To divide a quantity into parts which shall be in any given ratio, we may proceed as in the following examples.

Example 1.—Divide £834 among A, B, and C, so that their shares may be in the ratio of 3, 4, and 5.

$3 + 4 + 5 = 12$, hence we may divide the whole into 12 equal shares, and give 3 to A, 4 to B, and 5 to C.

$$\text{A's share} = \frac{£834}{12} \times 3 = £208\ 10s.$$

$$\text{B's } \text{„} = \frac{£834}{12} \times 4 = £278.$$

$$\text{C's } \text{„} = \frac{£834}{12} \times 5 = £347\ 10s.$$

Example 2.—A and B are paid £2 16*s.* 2*d.* for doing a piece of work; A worked $15\frac{3}{4}$ hours, B worked $12\frac{1}{3}$ hours; how should their earnings be divided?

We have to divide their earnings in the ratio of $15\frac{3}{4}$ to $12\frac{1}{3}$, *i.e.*, of $\frac{63}{4}$ to $\frac{37}{3}$, or of $\frac{189}{12}$ to $\frac{148}{12}$, or of 189 to 148, and we now proceed as above—

$$189 + 148 = 337$$

$$\text{A's share} = \frac{£2\ 16s.\ 2d.}{337} \times 189 = £1\ 11s.\ 6d.$$

$$\text{B's } \text{„} = \frac{£2\ 16s.\ 2d.}{337} \times 148 = £1\ 4s.\ 8d.$$

312.

1. Divide 592 in the proportion of 2, 5, 9.

2. Divide £2304 into four shares, in the proportion 3, 11, 13, 21.

3. In a school of 279 children, there are 4 boys to every 5 girls; how many are there of each?

4. A wood contains 5936 trees of oak, ash, and beech, in the proportion of 7, 5, 4; how many are there of each?

5. Divide £165 into five shares in the proportion of the numbers 1, 2, 3, 4, 5.

6. Black and green tea are mixed in the proportion of 1 lb. of green to 4 lbs. of black; how much of each is there in 28 lbs. 12 oz. of the mixture?

7. 12 gals. of wine is mixed with 4 gals. of water? find how much wine and how much water there is in 5 gals. of the mixture.

8. The English silver coinage is made of an alloy of which 37 parts in 40 are pure silver; find the weight of pure silver in 1 lb. of this metal.

9. Brass is composed of copper and zinc in the proportion of 16 parts of copper to 9 of zinc; find how much of each there is in 5 tons of brass.

10. Gunpowder is composed of 15 parts of nitre, 2 of sulphur, and 3 of charcoal; what weight of each is required to make 1 t. 15 cwt. of gunpowder?

11. A, B, and C join in business: A puts in £360, B £480, and C £600; if in one year they make a profit of £305, how should this be divided among them?

12. 96 sovereigns weigh 2 lbs. 13 dwts., and 1 part in 12 of the metal of which they are made is copper, how much gold do they contain?

13. A, B, C, and D receive for a week's work £9 4*s.* 2*d.*; they worked 50, 45, 40, and 35 hours respectively; what should be their shares of the wages?

14. 15-carat gold contains 15 parts of gold to 9 of copper; how much gold and how much copper is there in 3 oz. 15 dwts. of the alloy?

15. A, B, and C engage in business: A contributes three times as much capital as C, and B twice as much; divide between them a profit of £152 13*s.* 6*d.*

16. A man left £8463 to be divided between his two sons and three daughters, each son to receive twice as much as a daughter; what were their shares?

17. Divide £171 0*s.* 1*d.* in the ratio of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$.

18. Divide £2 4*s.* 9$\frac{1}{4}$*d.* in the ratio of $\frac{1}{2}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{1}{7}$.

19. A works regularly 7$\frac{1}{4}$ hours a day, B works 7, and C 8$\frac{1}{4}$; for a week's work the three together receive £4 2*s.* 6*d.*; divide it fairly between them.

INTEREST.

Interest is the consideration paid for the use of borrowed money.

The *rate of interest* is the sum paid for the use of £100 for one year; thus interest at 4 per cent. per annum means that £4 is paid for the use of £100 for one year.

The sum lent is called the *principal.*

The principal, together with the interest, is called the *amount.*

When the interest is reckoned only on the sum originally lent, it is called *simple interest.*

When the interest, instead of being paid to the lender as it falls due, is added on to the sum lent, so that each year the principal, and consequently the interest, is increasing, it is called *compound interest.*

To find the simple interest on any sum for any number of years, multiply the sum by the rate per cent. and the number of years, and divide by 100.

The reason for the rule will be clear from considering an example.

Example.—Find the simple interest on £356 16*s.* 8*d.* for 5 years at 4 per cent.

Since £4 is paid for the use of £100 for one year, the whole interest for one year must be $\frac{4}{100}$ of the sum lent, and therefore the interest for 5 years must be $5 \times \frac{4}{100}$ of £356 16*s.* 8*d.* To find what this comes to, we may proceed in either of the two ways given.

1st method—

£	s.	d.
356	16	8
		4
1427	6	8
		5
71,36	13	4
	20	
7,33		
	12	
4,00		

£71 7s 4d.

Notice here the method of dividing by 100.

2nd method—

$$5 \times \tfrac{4}{100} = \tfrac{20}{100} = \tfrac{1}{5},$$

Hence £356 16s. 8d. × 5 × $\tfrac{4}{100}$ = £356 16s. 8d. × $\tfrac{1}{5}$

= £71 7s. 4d.

313. Find the simple interest on—

	£	s.	d.						
1.	640	0	0	for	2	years	at	5	per cent.
2.	1325	0	0	„	3	„		4	„
3.	755	0	0	„	6	„		3	„
4.	3805	0	0	„	7	„		4	„
5.	1803	5	0	„	1	„		5	„
6.	1536	15	10	„	10	„		4	„
7.	734	12	6	„	3	„		5	„
8.	6702	8	4	„	15	„		6	„
9.	2980	2	1	„	11	„		2	„
10.	733	6	8	„	3	„		3	„

314. Find the amount of—

	£	s.	d.					
1.	1037	15	5	for 3	years at	$3\frac{1}{3}$	per cent.	
2.	632	4	2	„ 8	„	$3\frac{3}{4}$	„	
3.	7613	12	6	„ 4	„	$2\frac{1}{2}$	„	
4.	637	10	0	„ $3\frac{1}{2}$	„	4	„	
5.	401	13	2	„ $2\frac{1}{2}$	„	5	„	
6.	3505	8	4	„ 6	„	$4\frac{1}{2}$	„	
7.	6732	5	0	„ $3\frac{2}{3}$	„	5	„	
8.	506	6	8	„ $4\frac{3}{8}$	„	$2\frac{2}{7}$	„	
9.	7304	17	0	„ $2\frac{1}{4}$	„	$4\frac{4}{9}$	„	
10.	1035	12	6	„ $3\frac{3}{7}$	„	$2\frac{1}{3}$	„	

Many questions on simple interest may be stated as proportion sums.

Example 1.—In what time will the interest on £440 3*s.* 4*d.* at $2\frac{1}{2}$ per cent. amount to £33 0*s.* 3*d.*?

We find that the interest for 1 year on the given sum at $2\frac{1}{2}$ per cent. is £11 0*s.* 1*d.*, hence we have the proportion—

£	s.	d.	£	s.	d.	yr.
11	0	1	: 33	0	3	:: 1 : required number of years.

Example 2.—At what rate per cent. will £645 amount to £688 in 2 years?

The interest gained is £43. The interest on £645 for 2 years at 1 per cent. is £12 18*s.* Hence we have

£	s.	£	
12	18	: 43	:: 1 per cent. ∴ required percentage.

Example 3.—What sum of money will amount to £583 in $2\frac{1}{2}$ years at 4 per cent.?

At 4 per cent. £100 amounts in $2\frac{1}{2}$ years to £110. Hence we have

£	£	£	
110	: 100	:: 583	: required sum.

315.

1. In how many years will the interest on £650 at 2 per cent. amount to £52?

2. In what time will the interest on £872 6*s.* 8*d.* amount to £152 13*s.* 2*d.* at 5 per cent.?

3. The interest on £325 for 3 years is £39; what is the rate per cent.?

4. At what rate of interest will £1531 amount in 6 years to £1760 13*s.*?

5. What sum will amount to £241 10*s.* in 8 years at 5 per cent.?

6. What sum must be lent for 9 years at $2\frac{2}{3}$ per cent. to gain £127 4*s.* in interest?

7. In how many years will £100 double itself at $3\frac{1}{3}$ per cent. simple interest?

8. At what rate per cent will the interest on £1000 for 6 months be £19 7*s.* 6*d.*?

9. At what rate per cent. will the interest on £500 4*s.* 2*d.* for 3 years amount to £30 0*s.* 3*d.*?

10. In what time will £537 2*s.* 6*d.* make £161 2*s.* 9*d.* at 6 per cent.?

11. What sum will gain £112 interest in 4 years at $3\frac{1}{2}$ per cent.?

12. What sum will amount to £675 2*s.* 3*d.* in 3 years at $2\frac{2}{5}$ per cent.?

13. What sum will gain 1*s.* per day interest at 5 per cent.?

14. At what rate per cent. will the interest on £562 1*s.* 8*d.* for 4 years be £106 15*s.* 11*d.*?

15. In what time will the interest on £1030 8*s.* 4*d.* become £329 14*s.* 8*d.* at 6 per cent.?

COMPOUND INTEREST.

As the principal at compound interest increases from year to year, the interest for each year must be calculated separately. The work is shortened by using decimals; the divisions by 100 are then done simply by moving the decimal point. In general it will be sufficient to retain four places of decimals throughout the work.

Example.—Find the amount of £531 17*s.* 3*d.* for 2 years at 4 p. c. compound interest.

£531 17*s.* 3*d.* = £571·8625

4

22·874500 = Int. for 1st year.

571·8625

594·7370 = Principal for 2nd year.

4

23·78948 = Int. for 2nd year.

594·737

618·52648 = Amount.

20

10·52960

12

6·3552

618 10 6·3552 = 618 10 6½ nearly.

316. Find the amount at compound interest of—

1. £600 for 2 years at 3 per cent.
2. £8000 „ 3 „ 4 „
3. £1000 „ 3 „ 2½ „
4. £321 „ 2 „ 5 „
5. £732 10*s.* „ 2 „ 4 „

317. Find the compound interest on—

1.	£1536 5*s.*	for	3	years at	2	per cent.
2.	£402 12*s.*	„	2	„	$3\frac{1}{2}$	„
3.	£839 7*s.* 6*d.*	„	3	„	5	„
4.	£1307 15*s.*	„	4	„	3	„
5.	£5371 2*s.* 3*d.*	„	3	„	$4\frac{1}{2}$	„

USE OF THE TERM "PER CENT."

The ratio of one quantity to another of the same kind is often expressed by stating how many hundredth parts the one is of the other, the term *per cent.* being used. Thus if it be stated that in a certain mixture of wine and water 53 *per cent.* is water, the meaning is that out of every hundred parts of the mixture 53 are water, or the ratio of the water to the whole is that of 53 : 100.

Again, if an article be sold at a profit of 12 per cent., the selling price must be to the buying price in the proportion of 112 : 100. It is to be noticed that in the above example the numbers 112 and 100 are *abstract* numbers, no mention being made of a particular unit. Sometimes in speaking of money 100 *pounds* is taken as the standard. Thus the statement that an agent who sells goods for another receives a commission of £2 2*s.* 6*d.* *per cent.*, means, that for every £100 worth of goods sold the agent is paid £2 2*s.* 6*d.*, and for other sums in the same proportion.

All questions on percentages may be stated as proportions. The following will serve as examples—

1. Find the commission on a transaction of the value of £350 at $2\frac{1}{2}$ per cent.

$$\begin{matrix} & & £ \\ 100 & : & 2\tfrac{1}{2} \;::\; 350 : \text{Ans.} \end{matrix}$$

$$\text{Ans.} = £\frac{350 \times 2\frac{1}{2}}{100} = £8\ 15s.$$

2. The population of a certain town increased from 12340 to 14191 in ten years; find the increase per cent. 1851 is the increase on 12340, hence we have

$$12340 : 1851 :: 100 : \text{increase per cent.}$$

$$\text{Ans.} = \frac{1851 \times 100}{12340} = 15.$$

3. At what price must a horse bought for £72 10*s.* be sold so as to gain 20 per cent?

The buying price must be to the selling price in the ratio of 100 : 120, hence

$$100 : 120 :: £72\ 10s. : \text{Ans.}$$

$$\text{Ans.} = \frac{£72\ 10s. \times 120}{100} = £87.$$

4. A house is sold for £580 at a loss of 13 per cent; what did it cost?

Since 13 per cent. is *lost*, the selling price must be to the cost as 87 : 100. Hence

$$87 : 100 :: £580 : \text{Ans.}$$

$$\text{Ans.} = £\frac{580 \times 100}{87} = £666\ 6s.\ 8d.$$

5. By selling certain goods for £550 a profit of 25 per cent. is made; what profit per cent. would be made by selling for £564?

125 represents the selling price when the goods are sold for £550; let us find what will represent it when they are sold for £564. We have

$$£550 : £564 :: 125 : \text{number required.}$$

$$\text{Hence number required} = \frac{125 \times 564}{550} = 128\tfrac{2}{11}.$$

$$\text{Hence profit per cent} = 28\tfrac{2}{11}.$$

It is to be noticed that in all cases of percentage profit or loss, the number 100 is taken to represent the *cost price.*

318.

1. In a school of 125 children 52 per cent. are girls; find how many boys and how many girls there are in the school.

2. What should be the discount on a bill of £15 8*s.* 4*d.* if 5 per cent. be allowed for ready money?

3. In 18-carat gold there is 25 per cent. of copper; find the weight of pure gold in a brooch weighing 13 dwts.

4. Find the commission on a sale of goods of value of £80 6*s.* 8*d.* if 2½ per cent. be allowed to the agent.

5. Find the annual premium on a policy of life assurance for £2000 at £2 10*s.* 6*d.* per cent.

6. If with coffee 27 per cent. of chicory be mixed, find the weight of the latter required to mix with 1 cwt. 1 qr. 10 lbs. of the former.

7. A dishonest milkman mixes 2 gallons of water with 13 of milk; how much per cent. of the mixture is water?

8. An article is bought for £3 15*s.* and sold for £4 10*s.*; what is the profit per cent.?

9. An estate valued at £15420 yields a rental of £462 12*s.*; how much is that per cent.?

10. A horse bought for £85 is sold for £72 10*s.*; find the loss per cent.?

11. A grocer buys sugar at 2½*d.* per lb.; at what price must he sell it so as to gain 40 per cent.?

12. By selling tea at 2*s* 11½*d.* per lb. 42 per cent. is gained; what did it cost per lb.?

13. A horse is sold at a loss of 17½ per cent. for £43 9*s.*; what did he cost?

14. In a town of 13545 inhabitants 378 deaths occur in a year; how many is that per cent?

15. Rice bought at £1 per cwt. is retailed at 3*d.* per lb.; find gain per cent.

16. A case containing 1538 oranges is bought for £3; 98 are bad and rest sold for $\frac{3}{4}d.$ each; find the whole gain, and the gain per cent.

17. A cask contains 56 gals. 1 qrt. of wine, 20 per cent. more is added to it, and then 20 per cent. of the whole is drawn off; how much does it now contain?

18. The population of a town is 16000, and it increases at the rate of 5 per cent. every year; what will be its population at the end of three years?

19. By selling a cow for £31 5*s.* a profit of 25 per cent. is realised; what would have been the profit per cent. had she been sold for £32 10*s.*?

20. A piece of cloth containing 32 yds. is bought for 10 guineas and sold at 7*s.* 6*d.* per yd.; find the gain per cent.

TIME AND WORK.

No general rule can be given for such questions as follow; the methods to be used may be learnt from a few examples worked out.

Example 1.—A man does $\frac{3}{17}$ of a piece of work in an hour; how long will he take to finish the whole?

The number of hours required will be the number of times $\frac{3}{17}$ of the work is contained in the whole, *i.e.*,

$$= 1 \div \tfrac{3}{17} = \tfrac{17}{3} = 5\tfrac{2}{3}.$$

Example 2.—A piece of work is done in $3\frac{3}{4}$ hours; how much is done per hour?

We must divide the work by the number of hours, *i.e.*, $3\frac{3}{4}$, and hence we have $1 \div 3\frac{3}{4} = \frac{4}{15}$ per hour.

Example 3.—A can reap a field in 6 days, B can do it in 5; how long will they take if they work together?

A reaps $\frac{1}{6}$ of the field per day,
B " $\frac{1}{5}$ " "

Hence A and B together reap $\frac{1}{6} + \frac{1}{5}$ or $\frac{11}{30}$ per day, and therefore reap the whole in $\frac{30}{11}$ or $2\frac{8}{11}$ days.

Example 4.—A and B set out to meet one another from two places, distant 30 miles. A starts $2\frac{1}{2}$ hours before B, and walks 3 miles per hour, while B walks 4; how far will each have gone when they meet?

In $2\frac{1}{2}$ hours A goes $2\frac{1}{2} \times 3 = 7\frac{1}{2}$ miles. Hence when B starts the travellers are $22\frac{1}{2}$ miles apart, and this distance is diminished by $4 + 3$, or 7 miles per hour, hence they will meet in $22\frac{1}{2} \div 7$ hrs. $= 3\frac{3}{14}$ hrs., and in this time B has gone $3\frac{3}{14} \times 4 = 12\frac{6}{7}$ miles. Hence A has gone $30 - 12\frac{6}{7} = 17\frac{1}{7}$ miles.

319.

1. A piece of work is done in $5\frac{1}{2}$ hours; what part of it is done per hour?

2. A man walks a certain distance in 7 hrs. 35 m.; what fraction of the distance does he walk per hour?

3. A man does $\frac{5}{51}$ of a piece of work in an hour; how long will he take to finish it?

4. A river flows at the rate of $2\frac{1}{4}$ miles per hour; how long does it take to flow 1 mile?

5. A man walks $11\frac{3}{4}$ miles in 3 hours; how long does he take to walk 1 mile?

6. A man walks $15\frac{3}{4}$ miles in $4\frac{1}{2}$ hrs.; how much is that per hour?

7. A train travels $32\frac{1}{2}$ miles per hour; how long will it take for a journey of 91 miles?

8. $\frac{4}{17}$ of a cistern is filled by a pipe in 2 hrs.; how long will it take to fill the whole?

9. 3 men working at the same rate do $\frac{2}{5}$ of a piece of work per day; how long would one of them take to do the whole, working alone?

10. $\frac{2}{11}$ of a field is reaped by 4 men in an hour; how long would one man alone take to reap the whole?

11. $\frac{3}{10}$ of a piece of work is done in $3\frac{3}{5}$ hrs.; how long would the whole take?

12. A can do a piece of work in 3 days which B can

do in 6 days; how long will they take to do it working together?

13. A cistern is filled by one tap in 7 hrs., and by another in 5 hrs.; how soon will it be filled if both are open together?

14. A man can do a piece of work in 7 hours, his wife can do it in 8 hours; how long will they take to do it working together?

15. A and B together build a wall in 15 days. A alone would require 35 days; how long would B take to build it?

16. A cistern has three taps, which can fill it in 30 m., 40 m., and 1 hr. respectively; how long will they take to fill it if all are open at the same time?

17. Two trains, going 25 and 30 miles per hour respectively, start at 12 o'clock to meet one another on the same line of rails from two places distant 121 miles; at what time will they run into one another?

18. A mounted policeman sets out to catch a thief who has 8 miles' start; the thief walks $4\frac{1}{2}$ miles per hour, the policeman rides 10 miles per hour; how long will the chase last?

19. If a man works twice as fast as a woman, and a woman twice as fast as a boy, how long will a man, a woman, and a boy take to do a piece of work which three men could do in 15 hours?

MISCELLANEOUS EXAMPLES.

1. Reduce 10568 threepenny pieces to half-crowns.

2. Reduce to their lowest terms the fractions $\frac{4033}{91728}$, $\frac{4725}{19845}$.

3. Find the amount of a bill for the following articles: $5\frac{1}{2}$ lbs. butter at 1*s.* $3\frac{1}{2}$*d.* per lb.; $8\frac{1}{4}$ lbs. cheese at 11*d.*

per lb.; 7½ lbs. lard at 8½*d.* per lb.; 20 eggs at 1*s.* 6*d.* per dozen.

4. Divide $2\frac{7}{8}$ by $\frac{3}{5}$ of $4\frac{1}{3}$.

5. Find the value of 538 things at £3 8*s.* 4*d.* each.

6. What number must be subtracted from $431\frac{5}{13}$ to leave a remainder $315\frac{2}{9}$?

7. 3 cwt. of tea was bought for £37 16*s.* and retailed at 2*s.* 6*d.* per lb.; find the whole profit made.

8. Make out a bill for the following: 21 yds. Brussels carpet at 4*s.* 10*d.* per yd.; 8 chairs at £1 3*s.* 6*d.* each; 3 hearthrugs at 17*s.* 3*d.* each; 5 pairs curtains at £4 3*s.* 2*d.* per pair.

9. Divide £100 by $17\frac{3}{11}$.

10. How much will 135 yds. of cloth cost at 7*s.* 5½*d.* per yd.?

11. Reduce 3*s.* 4½*d.* to a decimal of £1.

12. Find the cost of 53 a. 2 r. of ground at £123 per acre.

13. Find the value of $2\frac{1}{4}$ of $\frac{5}{9}$ of $\frac{3}{15}$ of £5.

14. Divide the product of 365 and 469 by the difference between 1008 and 935.

15. Express $\frac{5}{6}$ as a fraction with denominator 3186.

16. Make out a bill for the following articles: 15 yds. silk at 8*s.* 4*d.* per yd.; 8 pairs hose at 3*s.* 4½*d.* per pair; 7 yds. calico at 1*s.* 0½*d.* per yd.; 5 handkerchiefs at 2*s.* 5¼*d.* each.

17. Add together 15·372; ·0056; 830·1; 57·203; ·14; 5·8; ·2371.

18. Find the value of $73\frac{3}{4}$ lbs. of tea at 2*s.* 7*d.* per lb.

19. Find the product of 15·015, 16·48, and 3·2.

20. Find the rent of a farm of 231 a. 3 r. at £3 15*s.* per acre.

21. Find the value of $1\frac{17}{18}$ of $\frac{72}{77}$ of half-a-guinea

22. Multiply 15·3448 by ·025, and divide 12·5 by ·0025.

23. Find the profit on 564 yds. of cloth bought at 4*s.* 11*d.* per yd. and sold at 5*s.* 4½*d.* per yd.

24. A gallon of water weighs 10 lbs.; how many tons flow down a stream in a day which discharges 7 gals. per second?

25. Divide the product of $\frac{5}{14}$ and $4\frac{4}{5}$ by their sum.

26. How many grains Troy are there in 5 cwt. 3 qrs. 7 lbs. avoirdupois?

27. Multiply £51 7*s.* 5*d.* by $16\frac{3}{4}$.

28. Find the cost of carpeting a room, if 42 yds. 1 qr. of carpet be used, and the price is 4*s.* 2*d.* per yard.

29. Multiply 35 a. 2 r. 15 p. by 321, and divide the result by 106 a. 3 r. 5 p.

30. Find the value of $15\frac{3}{8}$ lbs. of tea at 4*s.* 2*d.* per lb.

31. A nobleman has an income of £13359 a year; how much is that per hour in an ordinary year? how much in a leap year?

32. What fraction of 2*s.* 6*d.* is $\frac{4}{9}$ of 3*s.* 4*d.*?

33. An Irish mile contains 2240 yds.; what fraction is an English mile of an Irish?

34. A farmer buys 35 sheep at £2 18*s.* 6*d.* each; 4 of them die, and the rest he sells at £3 7*s.* 5*d.* each; what profit does he make?

35. Find the value of £·440625.

36. Add together $\frac{4}{5}$, $2\frac{1}{7}$, $13\frac{3}{10}$.

37. Find the value of 1427 things at 1*s.* 7¾*d.* each.

38. Find the whole cost of the following articles: 19½ lbs. beef at 11*d.* per lb.; 8 lbs. mutton at 9½*d.* per lb.; 2½ lbs. sausages at 8½*d.* per lb.; 3 ox tongues at 3*s.* 5*d.* each.

39. Find the sum of all the even numbers from 980 to 1000 inclusive.

40. How long would it require to count eight hundred millions of money at the rate of £100 a minute?

41. Bring 3*s.* 6*d.* to a decimal of £2 10*s.*

42. If my living costs me £1 8*s.* $8\frac{3}{4}d.$ per week, how much does it cost for a year of 52 weeks and 1 day?

43. Find the L.C.M. of 30, 27, 24, 18, 15, 10.

44. Express (1) $7\frac{1}{8}$ in. as a fraction of 1 ft.; (2) $11\frac{3}{7}$ lbs. as a fraction of 1 cwt.

45. How many yards of linen at 1*s.* $10\frac{1}{4}d.$ per yd. can be bought for £3 12*s.* $3\frac{3}{4}d.$?

46. A shilling weighs 3 dwts. 15 grs.; find the weight of £100 in silver.

47. Find the value of $\frac{7}{18}$ of a guinea; also of $\frac{13}{78}$ of £1 5*s.*

48. Find the cost of a cask of wine containing 113 gals. at 17*s.* $9\frac{1}{2}d.$ per gallon; if 21 gallons are lost by leakage and the remainder sold at 17*s.* 6*d.* per gallon, find the loss.

49. Find the rent of 25 *a.* 3 *r.* 10 *p.* at £4 3*s.* 5*d.* per acre.

50. 23 qrs. of corn are bought for £66 14*s.*; how much is that per bushel?

320.

1. If I spend 16 minutes over my breakfast, half-an-hour over dinner, and 20 minutes over tea, and if I sleep $7\frac{1}{2}$ hours each night, what fraction of my waking time do I spend in eating?

2. Find the area of the floor of a room which is 15 ft. 6 in. long. and 14 ft. 4 in. broad.

3. Simplify $\dfrac{\frac{25}{87} \times \frac{25}{87} - \frac{6}{29} \times \frac{6}{29}}{\frac{25}{87} + \frac{6}{29}}$.

4. If a flock of 80 sheep cost £360, how many sheep will there be in a flock that cost £607 10*s.* at the same average price per sheep.

5. Reduce 189550 half-guineas to half-crowns.

6. A telegraph wire weighs 5 cwt. per mile; how many tons of wire are required to reach from London to Edinburgh, a distance of 400 miles.

7. If 29 tons of coal cost £51 14*s.* 4*d.*, how much will 356 tons cost?

8. How many cubic feet of water will a cistern hold which is 12 ft. long, 8 ft. 6 in. broad, and 4 ft. 4 in. deep?

9. Simplify—

(1) $\frac{2}{5}$ of $6\frac{6}{7}$ of $\frac{14}{15}$.

(2) $22\frac{3}{11} - 8\frac{11}{15}$.

10. Reduce 6 f. 21 p. 4 yds. 2 ft. 6 in. to feet.

11. Find the G.C.M. of 135531 and 1331.

12. Find the weight of water in a cistern whose length is 4 ft. 3 in., breadth 2 ft. 6 in., and depth 1 ft. 8 in., a cubic foot of water weighing 1000 oz.

13. Reduce $\frac{2}{5}$ of 21*s.* to the decimal of £1.

14. Find the simple interest on £378 15*s.* for $3\frac{1}{2}$ years at $2\frac{2}{3}$ per cent.

15. If 4 men working 7 hours a day can dig 35 yds. of a drain in 3 days, how many yards can 13 men working 6 hours a day dig in 2 days?

16. What will 74 sheep cost at £43 5*s.* 10*d.* for 20?

17. How many half-guineas are equivalent to 21742 dollars, each worth 4*s.* 6*d.*?

18. Find the width of a plank 17 ft. 3 in. long, and having an area of 1656 sq. in.

19. What distance does a coach travel if its wheel, which measures 13 ft. 7 in. in circumference, makes 37416 revolutions?

20. Find the value of—

(1) $(2\frac{1}{2} + \frac{1}{6}) \div (3\frac{2}{3} - \frac{1}{8})$.

(2) $\dfrac{4\frac{1}{7} - 2\frac{1}{4}}{6\frac{1}{2} - 2\frac{1}{7}}$.

21. Find the area of the floor of a room which is 32 ft. 6 in. long and 23 ft. 9 in. wide.

22. If $\frac{2}{3}$ of an estate be worth £220, what is the value of $\frac{3}{11}$ of it?

23. How much money is there in a bag containing 47 sovereigns, 23 half-crowns, 11 florins, 46 shillings, and 13 sixpences?

24. If a bankrupt owes £6228, and can pay £188 2*s.* 9*d.*, how much does he pay in the pound?

25. Find the value of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{7}{8}$ of £16 18*s.*

26. Subtract $\frac{17}{29}$ of a pound from $\frac{23}{27}$ of a guinea, and express the result as a decimal of a pound.

27. What will it cost to pave a yard which is 30 ft. 10 in. long, and 12 ft. 11 in. broad, at 1*s.* 1*d.* per square foot?

28. Find the value of 217$\frac{1}{4}$ yds. of lace at £2 17*s.* 7$\frac{1}{2}$*d.* per yd.

29. If 6 men reap 16 acres of corn in a certain number of days, working 8 hours a day, how many hours a day must 9 men work in order to reap 30 acres in the same time?

30. One-third of the trees in an orchard are apple trees, one-fourth pear trees, one-sixth plum trees, and the remaining twelve cherry trees; how many trees does the orchard contain?

31. Find the value of $\cdot 13\dot{8}$ of £11 17*s.*

32. Reduce to vulgar fractions $\cdot 0\dot{2}5974\dot{1}$ and $\cdot 0\dot{5}1\dot{8}$.

33. A square field has each of its sides 33 poles long; find its area, also find how long it would take to walk round it at the rate of 3$\frac{2}{3}$ miles per hour.

34. Find the simple interest on £325 3*s.* 9*d.* for 3 years 73 days at 3$\frac{3}{4}$ per cent.

35. Find the cost of 25 tons 15 cwt. 3 qrs. at 12*s.* per cwt.

36. What fraction of £14 9*s.* 7*d.* is £8 13*s.* 9*d.*?

37. A soldier marches 112 paces, each of 30 inches, in a minute; how long will it take him to march 7 miles.

38. Four men dig 105 yards of a drain in 21 days, how many yards can 13 men dig in 12 days?

39. Express 5 qrs. 13 lbs. in Troy weight, and 28 lbs. 6 oz. 14 dwts. 4 grs. in avoirdupois weight.

40. A man left $\frac{1}{4}$ of his property to his wife, $\frac{1}{3}$ to his son, and $\frac{1}{6}$ to each of his two daughters, the remainder, which was £374, to an hospital; how much did he leave altogether?

41. Divide £100 among 5 people so that their shares may be in the proportion of the numbers 1, 2, 3, 4, 5.

42. 1875 cubic yards of earth were dug from a trench 125 yds. long and 5 yds. wide; how deep was it?

43. Add together $\frac{1}{5}$, $\frac{3}{8}$, $4\frac{7}{15}$, $4\frac{5}{24}$, and $1\frac{1}{60}$.

44. Find the simple interest on £5340 for 2 yrs. 4 ms. at $4\frac{1}{2}$ per cent.

45. After spending $\frac{5}{18}$ of my money I have left 7*s.*$0\frac{1}{2}$*d.*; how much had I at first?

46. A metre is equal to 39·3708 inches; express $\frac{3}{4}$ of a metre as a decimal of a yard.

47. If 17 tons 13 cwt. of iron cost £88 5*s.*, how much will 12 tons 3 cwt. cost?

48. A has $\frac{3}{7}$ of a business and sells $\frac{1}{4}$ of his share for £720. If B possesses $\frac{1}{3}$ of the business and sells $\frac{2}{5}$ of his share, how much should he get for it?

49. Find the value of ·208984375 of £8.

50. How many dozens of wine can be bottled from a pipe of port (126 gallons) if the bottles contain $1\frac{1}{2}$ pint each?

51. If the distance from the equator to the pole be 10,000,000 metres, and a metre = 39·3708 inches, express this distance in miles.

52. If 18 oxen cost £437 15*s.* 6*d.*, how many can be bought for £291 17*s.*?

53. A owes B £871 3*s.* 6*d.*, and B is indebted to A for 30 cwt. of coffee at 1*s.* 6*d.* per lb., and 96 chests of tea at £4 10*s.* 6*d.* per chest; how much money is still owing to B.

54. Divide £129 10*s.* among 3 people in the proportion of 13, 14, and 15.

55. Which is the greater, $1\frac{5}{9}$ of 1 ton 11 cwt., or $3\frac{3}{7}$ of 11 cwt. 6 lbs., and by how much?

56. A man sold a horse for £35, thereby losing $\frac{1}{8}$ of the purchase money; what did the horse cost?

57. If at 5*d.* in the pound I pay for poor-rate £3 16*s.* 3*d.*, what is the yearly value of my property?

58. What sum will amount to £567 15*s.* in 5 years at 4 per cent. simple interest?

59. If 939 men consume 351 quarters of wheat in 7 months, how many will consume 1464 quarters in 5 months?

60. Find the amount of wood in a cubical box whose outside dimensions are 3 ft., and which is made of wood 1 in. thick.

61. Add together $\frac{2}{5}$ of a pound, $\frac{5}{7}$ of a shilling, and $\frac{3}{5}$ of a guinea, and express the result as a fraction of £5.

62. A pond is 1 f. 120 yds. long; if a man skate 16 times from end to end, how far will he have gone altogether, and how long will it take him to do it if he can skate 1 mile in $5\frac{1}{2}$ minutes?

63. If a piece of land containing 3 a. 21 p. cost £282, what would 5 a. 2 r. 12 p. of the same land cost?

64. If a square foot of cloth weigh 1 oz., what will be the weight of a piece 30 yds. long and 28 in. broad?

65. Each link of a chain weighs $\frac{1}{4}$ oz., and 11 in. of chain contains 12 links; find the weight of a piece one mile long.

66. If 20 fowls produce on an average 7 eggs per day, how many should be obtained in a year from 68 fowls?

67. Cabbages are planted in a field in rows 18 in. apart, and 18 in. is left between the plants of each row; how many cabbages can be grown on one acre?

68. A river is 90 yds. wide, and its average depth is 10 ft.; it flows at the rate of 4 miles per hour: find how much water it discharges per minute.

69. A surveyor's chain is 22 yds. long and contains 100 links; what decimal of 1 fathom is the length of one link?

70. A bankrupt pays his creditors 12*s.* 6*d.* in the pound; what sum will a man lose to whom he owes £342 10*s.*?

71. A foot measure is too short by $\frac{1}{16}$ of an inch; what is the real length of a fence which, as measured by it, contains 135 yds.?

ANSWERS

TO THE EXAMPLES IN

MARCUS WARD'S ARITHMETIC.

PART I.

3.

1. 8, 13, 20, 15, 31, 56.
2. 14, 27, 19, 41, 92, 75.
3. 46, 64, 202, 181, 706, 1600.
4. 900, 1711, 1042, 790, 610.
5. 444, 2609, 1978, 1877.

4.

1. VIII., XI., XV., XXXII., CI., CCV.
2. XXIV., XXXVI., LXXXIV., XLI., LX., DX.
3. XLVI., LXIV., CCCLV., MIX., MMCC.
4. CDXLIII., MCMXXXVI., MMXLI., MMMCCCXVII., CMXC.
5. MDXXIII., MMDCCCXIX., MMMDCCXLIX., MLXVI., MDCCCXIV.

5.

1. 78	*3.* 98	*5.* 126	*7.* 136	*9.* 138
2. 99	*4.* 108	*6.* 141	*8.* 190	*10.* 179

6.

1. 157	*3.* 202	*5.* 270	*7.* 240	*9.* 290
2. 234	*4.* 173	*6.* 274	*8.* 244	*10.* 154

7.

1. 80	*5.* 171	*9.* 286	*13.* 281
2. 114	*6.* 266	*10.* 147	*14.* 278
3. 168	*7.* 269	*11.* 179	*15.* 205
4. 135	*8.* 299	*12.* 246	*16.* 276

8.

1. 95	*6.* 255	*11.* 367
2. 190	*7.* 137	*12.* 291
3. 250	*8.* 198	*13.* 178
4. 203	*9.* 135	*14.* 212
5. 211	*10.* 276	*15.* 334

9.

1. 56
2. 92
3. 132
4. 141
5. 146
6. 190
7. 253
8. 238
9. 204
10. 187
11. 200
12. 189
13. 223
14. 219
15. 193

10.

1. 210
2. 164
3. 161
4. 137
5. 280
6. 87
7. 175
8. 233
9. 174
10. 181
11. 161
12. 230
13. 90
14. 122
15. 152
16. 238
17. 177

11.

1. 1419
2. 1229
3. 1547
4. 2154
5. 1932
6. 2489
7. 1461
8. 3758
9. 3007
10. 2916

12.

1. 1374
2. 1795
3. 1181
4. 2228
5. 2245
6. 2623
7. 2615
8. 1603
9. 2345
10. 2476

13.

1. 1795
2. 1770
3. 3126
4. 2736
5. 3006
6. 1692
7. 1935
8. 1130
9. 1812
10. 1714
11. 1857
12. 2647
13. 1789
14. 2788
15. 1593

14.

1. 2037
2. 2826
3. 3280
4. 3411
5. 3422
6. 3287
7. 2786
8. 1694
9. 2189
10. 2326
11. 3063
12. 2706
13. 3203
14. 3527
15. 4495

15.

1. 2444
2. 2398
3. 2386
4. 1586
5. 1800
6. 1833
7. 1317
8. 3042
9. 1318
10. 2246
11. 2992
12. 2454
13. 2733
14. 1420
15. 2110

16.

1. 1123
2. 950
3. 694
4. 1530
5. 628
6. 1203
7. 1408
8. 1504
9. 2917
10. 2349
11. 639
12. 906
13. 1780
14. 2593
15. 1864
16. 1563

17.

1. 21246
2. 13789
3. 16790
4. 20389
5. 18755
6. 20091
7. 29100
8. 21009
9. 20190
10. 19002

18.

1. 28018	*3.* 8730	*5.* 16620	*7.* 21647	*9.* 22261
2. 14372	*4.* 17651	*6.* 18810	*8.* 12300	*10.* 13737

19.

1. 26680	*4.* 19879	*7.* 6625	*10.* 10772	*13.* 13480
2. 29603	*5.* 38586	*8.* 14029	*11.* 10314	*14.* 16574
3. 22908	*6.* 20679	*9.* 15555	*12.* 10778	*15.* 23815

20.

1. 28317	*4.* 35399	*7.* 15577	*10.* 29018
2. 27838	*5.* 30515	*8.* 15028	*11.* 16854
3. 28066	*6.* 9251	*9.* 22426	*12.* 8247

21.

1. 18856	*4.* 7568	*7.* 6259	*10.* 18198	*13.* 5434
2. 21072	*5.* 14948	*8.* 16937	*11.* 14475	*14.* 14723
3. 25015	*6.* 17776	*9.* 17975	*12.* 15316	*15.* 18229

22.

1. 11258	*5.* 12465	*9.* 4909	*13.* 17863
2. 16012	*6.* 2908	*10.* 6669	*14.* 6220
3. 7165	*7.* 6831	*11.* 8116	*15.* 7331
4. 16603	*8.* 20321	*12.* 3483	*16.* 7532

23.

1. 380463	*4.* 1139581	*7.* 201379	*10.* 233754
2. 192365	*5.* 1292538	*8.* 1484909	*11.* 1119563
3. 138881	*6.* 243379	*9.* 191672	*12.* 1128525

24.

1. 1048081	*4.* 229627	*7.* 13921101	*10.* 2228442
2. 1538466	*5.* 668291	*8.* 3579243	*11.* 2618957
3. 422582	*6.* 1052881	*9.* 1431207	*12.* 2430327

25.

1. 5102652	*6.* 382895
2. 704454	*7.* 359593088
3. 2007683	*8.* 1173841
4. 562459	*9.* 503965
5. 14303207	*10.* 5127084

27.

1. 144	*4.* 130	*7.* 21991	*10.* 1518	*13.* (1)239 (2)235
2. 77	*5.* 2942	*8.* 198	*11.* 3157	(3) 474
3. 797	*6.* 38	*9.* 326	*12.* 50835	*14.* 7940.

28.

1. 417	*6.* 5227	*11.* 1290	*16.* 4303
2. 411	*7.* 2343	*12.* 301	*17.* 6310
3. 425	*8.* 5435	*13.* 6072	*18.* 3101
4. 421	*9.* 312	*14.* 1171	*19.* 1011
5. 414	*10.* 4142	*15.* 102	*20.* 5500

29.

1. 1185	*6.* 2575	*11.* 709	*16.* 818
2. 2938	*7.* 480	*12.* 2496	*17.* 807
3. 5471	*8.* 1649	*13.* 3453	*18.* 688
4. 1768	*9.* 182	*14.* 919	*19.* 3691
5. 2362	*10.* 150	*15.* 1459	*20.* 884

30.

1. 50312	*6.* 8889	*11.* 3269	*16.* 28932
2. 17189	*7.* 31429	*12.* 5732	*17.* 9999
3. 21889	*8.* 3348	*13.* 7586	*18.* 12177
4. 53493	*9.* 8933	*14.* 2854	*19.* 9979
5. 5378	*10.* 42842	*15.* 894	*20.* 10406

31.

1. 49	*6.* 1769	*11.* 190825	*16.* 574185
2. 6	*7.* 810	*12.* 559110	*17.* 113197
3. 5094	*8.* 87	*13.* 19349	*18.* 88892
4. 952	*9.* 849	*14.* 246889	*19.* 57249
5. 3173	*10.* 6463	*15.* 109990	*20.* 283658

32.

1. 7189	*6.* 7868	*11.* 78787	*16.* 499411
2. 8167	*7.* 1937	*12.* 82899	*17.* 73657
3. 1085	*8.* 4891	*13.* 59749	*18.* 79258
4. 42828	*9.* 68789	*14.* 19989	*19.* 9899
5. 71292	*10.* 83932	*15.* 29979	*20.* 597799

33.

1. 59174	*7.* 155677	*13.* 99886	*19.* 390935
2. 63949	*8.* 99079	*14.* 800829	*20.* 569999
3. 81039	*9.* 27891	*15.* 99799	*21.* 656907
4. 28619	*10.* 8021	*16.* 743163	*22.* 333288
5. 91901	*11.* 208949	*17.* 595818	
6. 743908	*12.* 844515	*18.* 709322	

34.

1. 792	*7.* 4544	*13.* 909	*19.* 196319
2. 785	*8.* 7221	*14.* 75024	*20.* 116888
3. 963	*9.* 32307	*15.* 71502	*21.* 564682
4. 5562	*10.* 1633	*16.* 30938	*22.* 4686
5. 10899	*11.* 728859	*17.* 41976	*23.* 770885
6. 99090	*12.* 109079	*18.* 394588	*24.* 187671

35.

1. 90. *2.* 1891. *3.* 6681. *4.* 893. *5.* 3341. *6.* 1991. *7.* 622. *8.* 1597. *9.* 10798. *10.* 29198. *11.* 364697. *12.* 950847. *13.* 19981. *14.* 6105. *15.* 79238.

36.

1. 4769986. *2.* 989445. *3.* 142198. *4.* 2853. *5.* 98900. *6.* 43077. *7.* 3110. *8.* 994537. *9.* 61320. *10.* 2303560. *11.* 49209694. *12.* 1726609. *13.* 909091. *14.* 918. *15.* 170380559.

37.

1. 14458. *2.* 264. *3.* 5621. *4.* 621. *5.* (1) 756. (2) 44. *6.* 16810147. *7.* 328. *8.* 51. *9.* 4522. *10.* 95343. *11.* 103. *12.* 539. *13.* 2984679. *14.* 2154. *15.* 1789. *16.* (1)6245. (2)4186.

38.

1. 46332. *2.* 182452. *3.* 103560. *4.* 280210. *5.* 42528. *6.* 360918. *7.* 161525. *8.* 115604. *9.* 400675. *10.* 547476. *11.* 37071. *12.* 140760. *13.* 206739. *14.* 115604. *15.* 314095. *16.* 563136. *17.* 113900. *18.* 197930. *19.* 244182. *20.* 52092. *21.* 206832.

39.

1. 3065706. *2.* 8363091. *3.* 1548112. *4.* 5122164. *5.* 7732530. *6.* 3376821. *7.* 7873096. *8.* 4384552. *9.* 10456704. *10.* 1841625. *11.* 3765706. *12.* 10563091. *13.* 4748112. *14.* 11122164. *15.* 6842529 *16.* 733236. *17.* 3597781. *18.* 5202432. *19.* 4591644. *20.* 5552640. *21.* 3067274.

40.

1. 8071436, 20178590, 32285744.
2. 15567072, 31134144, 36323168.
3. 37895850, 46317150, 50527800.
4. 31708980, 25367184, 69759756.
5. 57876488, 21703683, 28938244.
6. 338945520, 296577330, 508418280.
7. 311220192, 155610096, 259350160.
8. 40737820, 81475640, 183320190.
9. 693814561, 441518357, 189222153.
10. 337340072, 295172563, 506010108.

41.

1. 543270.
2. 329400.
3. 5835100.
4. 3456000.
5. 1181480.
6. 5761490.
7. 2407500.
8. 1514520.
9. 2973600.
10. 860280.
11. 6673600.
12. 6538000.
13. 7832000.
14. 113592000.
15. 413602000.
16. 78328800.
17. 137700000.
18. 21800000.

42.

1. 85440860.
2. 74228775.
3. 160333333.
4. 517165882.
5. 399122171.
6. 148993950.
7. 69168870.
8. 77323176.
9. 790534317.
10. 534463920.
11. 389716352.
12. 192907589.
13. 226587942.
14. 445694040.
15. 387833754.
16. 410303880.
17. 375104175.
18. 125993182.
19. 151005358.
20. 121441977.
21. 249227511.
22. 409831890.

43

1. 762841020.
2. 5214834144.
3. 946728510.
4. 3506747510.
5. 2358613323.
6. 199697652.
7. 2504019105.
8. 1213407792.
9. 1107014708.
10. 4591559788.
11. 7568974644.
12. 3177823014.
13. 1506431520.
14. 2634246615.
15. 2378105808.
16. 3739439493.
17. 5322429800.
18. 8806598892.
19. 570615047.
20. 2664628348.
21. 1270227756.
22. 4647827481.

44

1. 1340386852.
2. 3282604422.
3. 6273081792.
4. 511320045.
5. 1141232100.
6. 6269257756.
7. 3196697104.
8. 692023704.
9. 2822932800.
10. 1540849842.
11. 21845967582.
12. 12181634005.
13. 21946504791.
14. 6006952000.
15. 14091903306
16. 38777288465.
17. 79621156296.
18. 16811386242.
19. 2435727360.
20. 37008055056.

45.

1. 39035910.
2. 63445200.
3. 278228340.
4. 267658600.
5. 48483440.
6. 4468944100.
7. 182800000.
8. 319200000.
9. 369696390.
10. 440550900.
11. 5334116990.
12. 30881562300.
13. 45181126400.
14. 18625553100.
15. 68883475200.
16. 63438690000.
17. 674068960000.
18. 28552165550.
19. 23213636000.
20. 170980600000.

46.

1. 400442015.
2. 183059838.
3. 2310573280.
4. 3213745001.
5. 131113704.
6. 4208850806.
7. 1444573832.
8. 4044696435.
9. 2555248580.
10. 56255554242.
11. 2168942688.
12. 4409770420.
13. 2645750250.
14. 2898771480.
15. 5849341080.
16. 7553767717I.
17. 50746326972.
18. 32800170000.
19. 285069916420.
20. 3060716041.
21. 172821427200.
22. 425340112068.
23. 266410476640.
24. 270735044688.

48.

1. 53207.
2. 182688.
3. 3628800.
4. 202301.
5. 36153036.
6. 163536.
7. 30026997000.
8. 461041.
9. 7546009.
10. 2890000.
11. 12321795560.
12. 628331.
13. 195942000.
14. 104329.
15. 6375600.

49.

1. 364.
2. £8232.
3. 162552.
4. 6935.
5. 326400.
6. 42196.
7. 21456.
8. 17316.
9. 650.
10. 2304.
11. 187910.
12. 4050000.
13. 142080.

50.

1. 17541.
2. 25227.
3. 9866.
4. 16694.
5. 26414.
6. 19137.
7. 102007.
8. 93952.
9. 10543.
10. 4425.
11. 4556.
12. 12277.
13. 15265.
14. 12001.
15. 11295 rem. 4.
16. 6314.
17. 2616.
18. 11331.

51.

1. 1781020 rem. 1.
2. 2907811 ,, 2.
3. 376681 ,, 2.
4. 740112 ,, 3.
5. 1384150 ,, 4.
6. 572769 ,, 2.
7. 1080159 ,, 1.
8. 260945 rem. 1.
9. 1226503 ,, 0.
10. 1506436 ,, 1.
11. 1134857 ,, 1.
12. 752079 ,, 1.
13. 1639540 ,, 3.
14. 414384 ,, 1.
15. 2075185 ,, 1.
16. 366158 rem. 3.
17. 316666 ,, 4.
18. 335582 ,, 6.
19. 629705 ,, 2.
20. 429227 ,, 4.
21. 2467827 ,, 1.
22. 1076095 ,, 2.

52.

1. 339758 rem. 1.
2. 877022 ,, 3.
3 835581 ,, 1.
4. 560054 ,, 6.
5. 1046518 ,, 2.
6. 485109 ,, 3.
7. 41243 ,, 5.
8. 124715 rem. 3.
9. 814744 ,, 6.
10. 772927 ,, 4.
11. 411869 ,, 2.
12. 561436 ,, 6.
13. 680078 ,, 1.
14. 731040 ,, 4.
15. 558129 rem. 5.
16. 844484 ,, 0.
17. 568345 ,, 5.
18. 537720 ,, 5.
19. 822311 ,, 5.
20. 384597 ,, 2.

53.

1.	710443 rem. 0.	*6.*	192850 rem. 5.
2.	589684 ,, 9.	*7.*	297691 ,, 3.
3.	115993 ,, 0.	*8.*	389751 ,, 9.
4.	944202 ,, 10.	*9.*	779108 ,, 10.
5.	3749195 ,, 9.	*10.*	490939 ,, 2.

54.

1.	7856 rem. 4.	*5.*	753 rem. 80.	*9.*	635 rem. 400.
2.	8037 ,, 0.	*6.*	573 ,, 756.	*10.*	279 ,, 3648.
3.	1308 ,, 75.	*7.*	532 ,, 160.	*11.*	3 ,, 4580.
4.	538 ,, 4.	*8.*	7103 ,, 8.	*12.*	7000 ,, 0.

55.

1. 13559364, 9039576, 2259894, 3013192.
2. 3801710, 3041368, 1382440, 1900855.
3. 311080, 233310, 186648, 266640.
4. 231912, 180376, 202923, 270564.
5. 171017, 155470, 244310, 342034.
6. 3757572, 250548, 125274, 1878786.
7. 3729690, 2933752, 1657640, 4972920.
8. 813127, 696966, 1626254, 2439381.
9. 9099180, 8088160, 36396720, 7279344.
10. 111636, 558180, 93030, 124040.
11. 4093320, 3069990, 1364440, 1227996.
12. 319968, 266640, 133320. 199980.

56.

1. 77521—6; 67831—5; 180884—1; 135663—1.
2. 844841—4; 760357—3; 1268262—1; 950446—5.
3. 383779—4; 298495—2; 1343228—1; 895485—2.
4. 1100939—2; 688087—1; 1376174—1; 550469—7.
5. 622166—1; 266642—5; 311083—1; 233312—3.
6. 807912—7; 1346521—1; 1009890—7; 897680—7.
7. 226604—5; 362567—2; 181283—7; 164803—4.
8. 879138—1; 488410—1; 399608—3; 366307—7.
9. 1188202—1; 712921—3; 594101—1; 1782303—1.
10. 2262581; 1439824—3; 5279355—2; 3167613—2.
11. 265332—5; 176888—5; 530660—1; 353776—5.
12. 427386—2; 1282158—2; 769295—1; 549496—4.

57.

1.	31207 rem. 1.	*6.*	33721 rem. 18.
2.	16695 ,, 17.	*7.*	263945 ,, 18.
3.	519225 ,, 11.	*8.*	17529 ,, 37.
4.	20914 ,, 11.	*9.*	128795 ,, 17.
5.	167988 ,, 17.	*10.*	145264 ,, 23.

57. *(Continued.)*

11. 105911 rem. 25.
12. 111263 ,, 21.
13. 111215 ,, 27.
14. 130136 ,, 25.
15. 150693 ,, 31.
16. 24623 ,, 6.
17. 5317 ,, 23.
18. 88001 ,, 40.
19. 18160 ,, 41.
20. 48927 rem. 8.
21. 96823 ,, 26.
22. 37537 ,, 27.
23. 47777 ,, 77.
24. 128692 ,, 46.
25. 9259 ,, 28.
26. 60795 ,, 10.
27. 33112 ,, 112.
28. 34960 ,, 36.

58.

1. 91268 rem. 34.
2. 63936 ,, 43.
3. 61563 ,, 15.
4. 191370 ,, 78.
5. 243553 ,, 7.
6. 366152 ,, 6.
7. 704766 ,, 60.
8. 2118552 ,, 2.
9. 118661 ,, 54.
10. 366419 ,, 101.
11. 18725 rem. 349.
12. 28306 ,, 200.
13. 22997 ,, 2.
14. 14724 ,, 4891.
15. 1447 ,, 6870.
16. 36580 ,, 74.
17. 127290 ,, 652.
18. 54076 ,, 35.
19. 143000 ,, 0.
20. 367538 ,, 2001.

59.

1. 98.
2. 5809.
3. 49.
4. 3559.
5. 251 sovs. 11 shillings.
6. 86012.
7. (1) 948 (2) 79.
8. (1) 354 (2) 177 (3) 118.
9. 3526.
10. 32 rows, 1 over.
11. 48 doz. and 9.
12. 12512.
13. 634.
14. 9317, 3993, 2541.
15. £13050, £8700, £4350.
16. 17.
17. 10128, 3376, 2532
18. 325.
19. 4, 8436

60.

1. 324.
2. 621.
3. 111.
4. 432.
5. 654.
6. 543.
7. 765.
8. 986.
9. 865.
10. 961.
11. 6358.
12. 1983.
13. 7812.
14. 58124.
15. 38425.
16. 93126.
17. 83124.
18. 68118.
19. 76123.
20. 95341.

61.

1. 123.
2. 314.
3. 536.
4. 271.
5. 246.
6. 813.
7. 724.
8. 835.
9. 344.
10. 846.
11. 3426.
12. 5123.
13. 3814.
14. 4329.
15. 8321.
16. 8982.
17. 3215.
18. 3189.
19. 3159.
20. 4879.

62.

1. 1635.
2. 654.
3. 1855.
4. 144.
5. 2295.
6. 1928.
7. 536.
8. 842.
9. 387.
10. 581.
11. 253163.
12. 84329.
13. 53724.
14. 912763.
15. 123456.
16. 724191.
17. 183542.
18. 7583614.
19. 279842.
20. 418376.

63.

1. 3740.
2. 95300.
3. 8340.
4. 34800.
5. 18460.
6. 871900.
7. 143200.
8. 3640000.
9. 83000.
10. 360000.
11. 3704.
12. 12034.
13. 130050.
14. 80092.
15. 307094.
16. 700630.
17. 90006.
18. 256060.
19. 508070.
20. 200706.

64.

1. 670 rem. 75.
2. 4631 ,, 117.
3. 16875 ,, 367.
4. 104550 ,, 35.
5. 16461 ,, 248.
6. 99659 ,, 24.
7. 30549 ,, 1293.
8. 34610 ,, 6210.
9. 11370 ,, 3411.
10. 147411 ,, 342.
11. 43127 rem. 621.
12. 47648 ,, 785.
13. 54732 ,, 296.
14. 4945 ,, 1024.
15. 1183220 ,, 352.
16. 36368 ,, 209.
17. 1228 ,, 27931.
18. 85365 ,, 8836.
19. 11577 ,, 15763.
20. 99982 ,, 3151.

65.

1. 3463 rem. 42.
2. 4710 ,, 251.
3. 64924 ,, 369.
4. 18488 ,, 1021.
5. 291 ,, 41657.
6. 684 ,, 70432.
7. 32294 ,, 1544.
8. 3371 rem. 3160.
9. 8607 ,, 1200.
10. 84 ,, 75.
11. 424 ,, 51005.
12. 2265 ,, 52340.
13. 27586 ,, 60.
14. 462 ,, 9240.

66.

1. 911.
2. 37.
3. 9966 rem. 234.
4. 110.
5. £395 and 200*d*.
6. 238.
7. 703.
8. Quotient 530, rem. 43.
9. 724.
10. 131.
11. 47.
12. 5007.
13. 238.
14. 107.
15. 3025.
16. 2083.
17. 1600 minutes.
18. £763.
19. £55.
20. 110.
21. 142 times, rem. 5006.
22. 18, 96.

MISCELLANEOUS EXAMPLES.

1. 38752.
2. 6375.
3. 235.
4. Fifty thousand six hundred and five.
5. £154.
6. 14784.
7. 215.
8. 156.
9. 623447.
10. 7433.
11. 22.
12. 744.
13. 504.
14. 42864.
15. £196, £147, £245.
16. 15204.
17. 138 miles.
18. 1903.
19. 820.
20. 897.
21. 1704.
22. 91.
23. 79716.
24. 210.
25. 1305984.
26. £1663.
27. 1837.
28. 38840.
29. £09904.
30. 144, 119.
31. 43.
32. 5749299.
33. £164.
34. 5133.
35. £15.
36. 39.
37. 2252.
38. 23930016.
39. 781.
40. 511.
41. 531454.
42. 38.
43. 388.
44. 420 miles; 15 hours.
45. 479001600.
46. 47.
47. 19558.
48. 4320.
49. (1) 3008; (2) 429.
50. 67160.
51. 388.
52. 644.
53. 162.
54. 3482.
55. 2454.
56. 204.
57. 21.
58. 1152340.
59. 1571.
60. 6039420.
61. 16.
62. 25.
63. 330.
64. 13538.
65. 91.
66. 20.
67. 36.

PART II.

67.

1. 11680.
2. 10512.
3. 31844.
4. 330240.
5. 35280.
6. 15144.
7. 41520.
8. 15360.
9. 38064.
10. 438720.
11. 23436.
12. 39180.
13. 2933760.
14. 1382976.
15. 880920.
16. 570528.

68.

1. 264.
2. 2077.
3. 234.
4. 348.
5. 302.
6. 1851.
7. 4451.
8. 3820.
9. 203.
10. 903.
11. 2074.
12. 36258.
13. 40007.
14. 471.
15. 1677.
16. 152290.
17. 48145.
18. 982.
19. 171130.
20. 20163.

69.

	£	s.	d.
1.	26803	12	0
2.	22	3	1
3.		19	$7\frac{3}{4}$
4.	51	17	4
5.	736	10	9
6.	17	6	$5\frac{1}{4}$
7.	802	1	$8\frac{1}{2}$
8.	3029	17	6
9.	557	0	$3\frac{1}{2}$
10.	3001	10	10
11.	62	18	$2\frac{1}{2}$
12.	39	11	$8\frac{3}{4}$
13.	662	13	11
14.	5638	19	3
15.	632	10	$0\frac{1}{2}$
16.	6237	8	11
17.	400	13	$7\frac{1}{4}$
18.	192	0	$0\frac{1}{4}$
19.	734	16	0
20.	5376	4	10

70.

1. £1070 8*s.*
2. 21133.
3. £13900 9*s.*
4. 8419.
5. 16815582.
6. 211 gs.
7. £10756 15*s.*
8. 1373.
9. 748370.
10. 1591260.
11. 1217.
12. 220248.
13. 800 gs.
14. 853692.
15. 31017.
16. 4483.
17. 7563.
18. 82472.
19. 822 gs.
20. 4521.

71.

1. 1978.
2. £100.
3. £4166 13*s.* 4*d*
4. 39600.
5. 125.
6. 45080.
7. 45108.
8. 147.
9. 354816.
10. £1000 13*s.*
11. 158.
12. 6960.
13. (1) 2910 (2) 582 (3)4365.
14. (1) 34020 (2) 8100.
15. (1) £13 10*s.* (2) £3475.
16. (1) 566 (2) 192076.

72.

	d.
1.	$1\frac{3}{4}$
2.	$1\frac{3}{4}$
3.	$2\frac{1}{2}$
4.	2
5.	2
6.	$1\frac{1}{2}$

	s.	*d.*
7.	3	1
8.	3	5
9.	3	8
10.	2	7
11.	4	3
12.	3	6

	£	*s.*
13.	1	18
14.	1	13
15.	1	19
16.	3	0
17.	3	6
18.	2	19

73.

	s.	d.
1.		10
2.		$11\frac{1}{2}$
3.		$9\frac{3}{4}$
4.		$9\frac{1}{4}$
5.		$11\frac{3}{4}$
6.	2	$0\frac{1}{2}$
7.	2	$0\frac{3}{4}$
8.	2	$3\frac{1}{4}$
9.	3	$9\frac{1}{4}$
10.	2	10

74.

	s.	d.
1.	3	$0\frac{1}{2}$
2.	2	7
3.	3	$0\frac{3}{4}$
4.	3	$2\frac{3}{4}$
5.	2	9
6.	2	4
7.	2	9
8.	3	$5\frac{1}{4}$
9.	2	7
10.	3	4

75.

	£	s.	d.
1.		19	3
2.		13	6
3.	1	0	5
4.		16	4
5.		18	8
6.	2	6	1
7.	2	6	$4\frac{1}{2}$
8.	3	6	7
9.	2	2	4
10.	2	10	8

76.

	£	s.	d.
1.	2	0	7
2.	1	18	9
3.	2	3	11
4.	2	13	10
5.	3	8	8
6.	3	7	4
7.	3	14	11
8.	2	17	2
9.	1	18	2
10.	3	13	2

77.

	£	s.	d.
1.	1	0	$6\frac{3}{4}$
2.	1	3	$9\frac{3}{4}$
3.	1	18	$6\frac{1}{2}$
4.	1	8	$0\frac{1}{4}$
5.	1	14	10
6.	2	7	7
7.	1	17	$8\frac{1}{2}$
8.	1	19	$5\frac{1}{4}$
9.	1	12	$0\frac{1}{4}$
10.	2	11	$1\frac{1}{2}$

78.

	£	s.	d.
1.	1	3	$10\frac{3}{4}$
2.	1	9	$4\frac{3}{4}$
3.	1	17	$10\frac{1}{4}$
4.	1	10	$8\frac{1}{2}$
5.	1	12	$2\frac{3}{4}$
6.	2	14	10
7.	2	7	$0\frac{1}{2}$
8.	2	12	1
9.	1	6	$6\frac{1}{2}$
10.	3	6	$5\frac{1}{4}$

79.

	£	s.	d.
1.	22	16	5
2.	19	4	10
3.	23	17	10
4.	25	15	2
5.	27	17	2
6.	62	2	9
7.	40	19	6
8.	32	13	3
9.	45	14	9
10.	53	5	6
11.	32	10	4
12.	57	6	8

80.

	£	s.	d.
1.	18	6	$7\frac{3}{4}$
2.	30	7	$4\frac{1}{2}$
3.	40	15	$1\frac{1}{4}$
4.	27	18	$1\frac{3}{4}$
5.	66	12	$7\frac{1}{2}$
6.	58	10	$8\frac{1}{4}$
7.	48	11	$8\frac{1}{2}$
8.	144	2	$3\frac{1}{4}$
9.	76	5	$8\frac{3}{4}$
10.	88	4	10
11.	124	15	$6\frac{1}{4}$
12.	154	1	2

81.

	£	s.	d.
1.	102	8	$2\frac{1}{2}$
2.	154	9	11
3	192	2	$6\frac{1}{4}$
4.	314	17	$4\frac{1}{2}$
5.	358	2	$10\frac{1}{4}$
6.	248	4	$5\frac{1}{2}$
7.	197	16	3
8.	264	18	8
9.	394	18	$4\frac{1}{2}$
10.	259	14	$10\frac{1}{4}$

1. 11680.
2. 10512.
3. 31844.
4. 330240.
5. 35
6. 15
7. 41
8. 15

1. 264.
2. 2077.
3. 234.
4. 348.
5. 302.
6. 185
7. 445
8. 382
9. 205
10. 903

	£	s.	d.
1.	26803	12	0
2.	22	3	1
3.		19	7¾
4.	51	17	4
5.	736	10	9
6.	17	6	5½
7.	802	1	8½

1. £1070 8s.
2. 21133.
3. £13900 9s.
4. 8419.
5. 16815582.
6.
7.
8.
9.
10.

1. 1978.
2. £100.
3. £416
4. 396
5. 1
6.
7.

88.

	£	s.	d.
7.	5	8	4¼
8.	21	1	6¾
9.	157	1	1½
10.	13	17	1
11.	38	14	5
12.	17	6	6
13.	32	18	9
14.	360	10	5½
15.	637	17	9
16.	85	7	11¼
17.	277	17	1¼

90.

	£	s.	d.
1.	1	11	3¾
2.	7	18	1½
3.	54	13	0¾
4.	46	2	9¼
5.	8	17	10½
6.	62	17	2¾
7.	653	9	8½
8.	276	6	3½
9.	7	13	10¾
10.	653	2	10½
11.	35	16	5½
12.	500	11	8

91.

	£	s.	d.
1.	5787	19	4½
2.	833	10	8½
3.	1823	17	10½
4.	6318	18	9
5.	759	5	3½
6.	398	15	8¾
7.	1	14	5½
8.		14	3
9.	1	17	3¾
10.	65	5	9¾
11.	459	14	3½
12.	5655	15	0½

93.

	£	s.	d.
1.	1	14	0½
2.	2	16	11½
3.	163	7	10
4.	1979	9	6
5.	38	17	10½
6.	254	7	6
7.	1	4	9½
8.		17	4½
9.	8961	14	9
	8	17	10

94.

1. £2 19s. 1½d.
2. £5 7s. 0d.
3. £19 19s. 10d.
4. 4s. 8½d.
5. £541 2s. 2d.
6. A, 18s. 7d.; B, £1 2s. 9½d.
7. £1213 16s. 1d.
8. £172 17s. 6d.
9. Lost £13 15s. 4d.

97.

	£	s.	d.
1.		16	8
2.		13	6
3.		15	6
4.		14	3
5.		19	8
6.		17	6
7.		13	9
8.		15	2
9.		18	8
10.	1	3	0

98.

	£	s.	d.
1.	1	15	10
2.	2	18	4
3.	1	17	6
4.	2	3	6
5.	3	16	1
6.	1	10	6
7.	2	9	8
8.	4	2	0
9.	7	2	0
10.	9	7	0

82.

	£	s.	d.
1.	1477	0	$3\frac{3}{4}$
2.	698	12	$5\frac{3}{4}$
3.	107	14	$11\frac{1}{2}$
4.	725	9	$9\frac{1}{2}$

	£	s.	d.
5.	811	3	$6\frac{1}{2}$
6.	770	4	$5\frac{1}{4}$
7.	196	4	$8\frac{3}{4}$
8.	95	8	$0\frac{3}{4}$

	£	s.	d.
9.	755	13	8
10.	553	2	$6\frac{3}{4}$
11.	908	8	$10\frac{1}{4}$
12.	629	0	$3\frac{3}{4}$

83.

	£	s.	d.
1.	671	11	8
2.	84	4	$7\frac{1}{2}$
3.	637	1	$9\frac{3}{4}$
4.	1129	12	$0\frac{1}{4}$
5.	29	15	0

	£	s.	d.
6.	677	4	0
7.	479	1	$5\frac{3}{4}$
8.	37	19	$1\frac{1}{2}$
9.	1117	0	$11\frac{1}{4}$
10.	124	15	9

84.

	£	s.	d.
1.	2	11	$2\frac{1}{2}$
2.		17	3
3.	10	13	6

	£	s.	d.
4.	2	18	1
5.	1	5	5
6.	1	11	9

	£	s.	d.
7.	668	1	4
8.	1	4	10
9.	875	9	10

85.

	s.	d.
1.	5	$3\frac{1}{4}$
2.	15	$4\frac{1}{4}$
3.	2	$2\frac{1}{4}$
4.	12	$3\frac{1}{4}$

	£	s.	d.
5.		14	$10\frac{1}{4}$
6.	22	12	3
7.	7	8	3
8.	8	0	$3\frac{1}{4}$
9.	27	4	5

	£	s.	d.
10.	73	6	$0\frac{1}{4}$
11.	3	8	$9\frac{1}{4}$
12.	79	2	$6\frac{1}{4}$
13.	151	4	0

86.

	s.	d.
1.	3	$4\frac{3}{4}$
2.	12	$1\frac{1}{2}$
3.	4	$2\frac{3}{4}$
4.	9	$0\frac{3}{4}$
5.	11	$0\frac{1}{2}$

	s.	d.
6.	3	9
7.	6	$6\frac{1}{4}$
8.	8	$11\frac{1}{4}$
9.	10	$11\frac{1}{2}$

	£	s.	d.
10.		3	9
11.	2	3	8
12.	11	3	7
13.	7	5	$1\frac{3}{4}$
14.	18	0	$10\frac{1}{4}$

87.

	£	s.	d.
1.		6	$0\frac{3}{4}$
2.		6	7
3.	2	17	3
4.	7	16	$2\frac{1}{4}$
5.		19	4

	£	s.	d.
6.	15	6	4
7.	167	16	4
8.	1	4	$7\frac{1}{4}$
9.	89	6	$5\frac{3}{4}$
10.	511	14	3

88.

	£	s.	d.
1.		3	$6\frac{3}{4}$
2.		1	$10\frac{3}{4}$
3.		13	$3\frac{1}{2}$
4.		10	$10\frac{1}{2}$
5.		3	$5\frac{3}{4}$
6.	2	4	$4\frac{3}{4}$
7.		5	$8\quad 4\frac{3}{4}$
8.		21	$1\quad 8\frac{3}{4}$
9.		157	$1\quad 10\frac{3}{4}$
10.		13	17 11
11.		38	14 5
12.		17	6 6
13.		32	18 9
14.		360	10 $5\frac{1}{2}$
15.		637	17 9
16.		85	$7\quad 11\frac{1}{4}$
17.		277	17 $11\frac{1}{4}$

89.

	£	s.	d.
1.	1780	16	8
2.	73	16	$0\frac{3}{4}$
3.	76	10	$8\frac{1}{2}$
4.	83	14	$6\frac{3}{4}$
5.	738	19	$0\frac{3}{4}$
6.	917	10	$8\frac{1}{4}$
7.	5459	9	11
8.	35	1	2
9.	388	9	$10\frac{3}{4}$
10.	468	17	$9\frac{3}{4}$
11.	1388	18	$5\frac{3}{4}$
12.	5590	16	6

90.

	£	s.	d.
1.	1	11	$3\frac{3}{4}$
2.	7	18	$1\frac{3}{4}$
3.	54	13	$0\frac{3}{4}$
4.	46	2	$9\frac{1}{2}$
5.	8	17	$10\frac{1}{2}$
6.	62	17	$2\frac{3}{4}$
7.	653	9	$8\frac{1}{2}$
8.	276	6	$3\frac{1}{2}$
9.	7	13	$10\frac{3}{4}$
10.	653	2	$10\frac{1}{2}$
11.	35	16	$5\frac{1}{4}$
12.	500	11	8

91.

	£	s.	d.
1.	5787	19	$4\frac{1}{4}$
2.	833	10	$8\frac{1}{2}$
3.	1823	17	$10\frac{1}{2}$
4.	6318	18	9
5.	759	5	$3\frac{1}{2}$
6.	398	15	$8\frac{3}{4}$
7.	1	14	$5\frac{1}{2}$
8.		14	3
9.	1	17	$3\frac{3}{4}$
10.	65	5	$9\frac{3}{4}$
11.	459	14	$3\frac{1}{3}$
12.	5655	15	$0\frac{1}{2}$

92.

	£	s.	d.
1.		13	4
2.	159	0	$9\frac{1}{2}$
3.	1	17	$0\frac{1}{4}$
4.	10	9	0
5.	7	12	$4\frac{1}{2}$
6.	14	19	$11\frac{3}{4}$
7.		19	$11\frac{3}{4}$
8.		16	$11\frac{1}{2}$
9.	8661	8	1
10.	135	19	$11\frac{1}{4}$

93.

	£	s.	d.
1.	1	14	$0\frac{1}{2}$
2.	2	16	$11\frac{1}{2}$
3.	163	7	10
4.	1979	9	6
5.	38	17	$10\frac{1}{4}$
6.	254	7	6
7.	1	4	$9\frac{1}{2}$
8.		17	$4\frac{1}{4}$
9.	8961	14	9
10.	8	17	10

94.

1. £2 19*s.* $1\frac{1}{2}$*d.*
2. £5 7*s.* 0*d.*
3. £19 19*s.* 10*d.*
4. 4*s.* $8\frac{1}{4}$*d.*
5. £541 2*s.* 2*d.*
6. A, 18*s.* 7*d.*; B, £1 2*s.* $9\frac{3}{4}$*d.*
7. £1213 16*s.* 1*d.*
8. £172 17*s.* 6*d.*
9. Lost £13 15*s.* 4*d.*

95.

	d.
1.	$10\frac{1}{2}$
2.	$9\frac{3}{4}$
3.	$8\frac{3}{4}$
4.	$11\frac{1}{4}$
5.	$11\frac{1}{4}$
6.	10
7.	$11\frac{1}{4}$
8.	$11\frac{1}{2}$
9.	$11\frac{1}{2}$
10.	$11\frac{1}{4}$

96.

	s.	d.
1.	3	$11\frac{1}{4}$
2.	6	$4\frac{1}{2}$
3.	1	$9\frac{3}{4}$
4.	3	10
5.	1	$9\frac{1}{2}$
6.	4	2
7.	6	$5\frac{1}{2}$
8.	3	$6\frac{1}{2}$
9.	3	$5\frac{1}{4}$
10.	3	$2\frac{1}{2}$

97.

	£	s.	d.
1.		16	8
2.		13	6
3.		15	6
4.		14	3
5.		19	8
6.		17	6
7.		13	9
8.		15	2
9.		18	8
10.	1	3	0

98.

	£	s.	d.
1.	1	15	10
2.	2	18	4
3.	1	17	6
4.	2	3	6
5.	3	16	1
6.	1	10	6
7.	2	9	8
8.	4	2	0
9.	7	2	0
10.	9	7	0

99.

	£	s.	d.
1.		16	10½
2.	1	2	2
3.	4	6	9
4.	1	12	4½
5.	1	16	9
6.	3	0	4½
7.	1	18	10½
8.	1	9	7
9.	5	10	9¾
10.	7	12	7½

100.

	£	s.	d.
1.	10	7	4
2.	29	5	8
3.	74	3	0
4.	123	14	0
5.	25	8	1
6.	7	11	8
7.	78	1	6
8.	32	3	9
9.	28	18	4
10.	45	9	0

101.

	£	s.	d.
1.	6	10	4½
2.	26	14	3½
3.	51	1	4½
4.	60	19	0
5.	29	12	3¾
6.	49	19	7½
7.	76	11	10½
8.	20	9	9
9.	46	15	4½
10.	107	16	3

102.

	£	s.	d.
1.	440	0	3
2.	217	1	10¾
3.	67	11	4½
4.	388	16	6
5.	518	17	4½
6.	250	9	9½
7.	703	16	3
8.	767	11	10½
9.	412	6	6¾
10.	379	19	9

103.

	£	s.	d.
1.	1297	3	4½
2.	1731	6	4½
3.	3945	4	5¾
4.	845	6	10¾
5.	4698	11	5½
6.	1749	13	8
7.	4234	19	3¾
8.	4385	9	4½
9.	10953	3	6
10.	7248	9	9

104.

	£	s.	d.
1.	51552	12	5½
2.	10613	0	0
3.	108602	19	3¾
4.	36911	6	6
5.	80594	5	8¼
6.	81117	8	5¼
7.	93644	16	9
8.	23549	6	6
9.	75290	6	10½
10.	94872	8	9

105.

	£	s.	d.
1.	1	17	5¾
2.		15	1½
3.	3	5	3
4.	5	6	9
5.		6	5½
6.	241	0	0
7.	30	14	7
8.	482	2	0
9.	15	0	2½
10.	2	0	9
11.	114	4	6

106.

	£	s.	d.
1.	610	10	7½
2.	1717	1	1½
3.	2356	5	4
4.	332	4	7½
5.	1369	3	1½
6.	1809	1	3
7.	463	9	2
8.	529	9	0¾
9.	2105	17	9
10.	1066	11	1½
11.	46066	10	4½
12.	26825	15	6
13.	52490	14	0
14.	34034	1	3
15.	26669	7	9
16.	52877	7	6¾
17.	86136	0	0
18.	70128	3	9
19.	30942	4	10½
20.	53596	5	3

107.

	£	s.	d.
1.	935	19	2
2.	12912	18	9
3.	593	1	3
4.	421	14	2
5.	21559	6	5
6.	10474	7	6½
7.	279365	0	0
8.	122834	1	3
9.	309825	0	0
10.	630903	2	6

108.

	£	s.	d.
1.	91	11	$4\frac{1}{2}$
2.	161	9	$9\frac{3}{4}$
3.	649	17	$9\frac{1}{2}$
4.	905	13	$0\frac{3}{4}$
5.	3469	12	11
6.	487	14	$1\frac{1}{2}$
7.	1043	10	$8\frac{1}{2}$
8.	1641	10	6
9.	2728	4	$8\frac{1}{4}$
10.	8063	0	9
11.	7957	4	$6\frac{1}{2}$
12.	4538	6	0
13.	12966	1	$0\frac{1}{4}$
14.	1936	13	$9\frac{1}{2}$
15.	2536	17	6
16.	9296	11	$11\frac{1}{4}$
17.	5633	13	2
18.	6785	14	$0\frac{3}{4}$
19.	9222	5	$8\frac{1}{2}$
20.	5721	8	$0\frac{3}{4}$
21.	108	15	$8\frac{1}{2}$
22.	1388	17	$1\frac{1}{4}$
23.	777	1	9
24.	5044	6	$0\frac{3}{4}$
25.	1463	3	$9\frac{1}{4}$
26.	589	9	$7\frac{1}{2}$

109.

	£	s.	d.
1.	1107	8	6
2.	4747	5	$3\frac{3}{4}$
3.	19863	4	8
4.	6917	7	$1\frac{1}{2}$
5.	13585	10	$6\frac{3}{4}$
6.	36835	5	4
7.	69196	16	$1\frac{1}{2}$
8.	814800	1	7
9.	451091	3	9
10.	3926784	14	$2\frac{3}{4}$
11.	6023720	16	$6\frac{3}{4}$
12.	5762553	14	8
13.	374560	5	$6\frac{1}{2}$
14.	2008530	14	$7\frac{1}{2}$

110.

	£	s.	d.
1.	17303	12	11
2.	26840	17	7
3.	23160	17	$6\frac{3}{4}$
4.	75358	16	$5\frac{1}{2}$
5.	579971	11	$10\frac{1}{4}$
6.	1818543	18	4
7.	4975991	5	0
8.	1459288	3	9
9.	3343914	11	$7\frac{1}{2}$
10.	7175571	14	$0\frac{3}{4}$

111.

	£	s.	d.
1.	161	5	0
2.	477487	10	0
3.	67	10	$5\frac{1}{4}$
4.	153	8	7
5.	119	18	3
6.	8	6	0
7. (1)	74	14	$9\frac{1}{2}$
(2)	2615	17	$8\frac{1}{2}$
8.	306	5	5
9.	1092	8	$7\frac{3}{4}$
10.	11638	3	11
11.	4448	3	6
12.	17	2	$3\frac{1}{2}$

112.

	d.
1.	$\frac{3}{4}$
2.	$\frac{1}{2}$
3.	$\frac{3}{4}$
4.	$\frac{1}{4}$
5.	$4\frac{1}{4}$
6.	$2\frac{3}{4}$
7.	$1\frac{1}{2}$
8.	$2\frac{1}{4}$
9.	$2\frac{3}{4}$
10.	$3\frac{3}{4}$

113.

	s.	d.
1.	6	1
2.	5	7
3.	1	6
4.	2	10
5.	1	2
6.	2	7
7.	2	9
8.	2	2
9.	4	4
10.	1	11

114.

	s.	d.
1.	3	$3\frac{1}{2}$
2.	4	$10\frac{1}{2}$
3.	8	$11\frac{1}{4}$
4.	1	$9\frac{3}{4}$
5.	2	$7\frac{3}{4}$
6.	1	$9\frac{3}{4}$
7.	2	$8\frac{1}{2}$
8.	1	$10\frac{1}{4}$
9.	3	$5\frac{1}{4}$
10.	2	$10\frac{1}{4}$

115.

	£	s.	d.
1.	2	7	6
2.	5	14	2
3.	6	11	5
4.	1	12	3
5.	3	16	2
6.	7	3	2
7.	2	5	7
8.	7	10	7
9.	1	8	9
10.	2	3	5

116.

	£	s.	d.
1.	5	8	$6\frac{1}{4}$
2.	7	12	$2\frac{1}{4}$
3.	6	12	$7\frac{1}{4}$
4.	8	11	$10\frac{1}{4}$
5.	2	9	$3\frac{3}{4}$
6.	9	13	$7\frac{1}{2}$
7.	7	10	$10\frac{1}{2}$
8.	9	14	$7\frac{1}{2}$
9.	6	15	$11\frac{3}{4}$
10.	12	15	$4\frac{1}{4}$

117.

	£	s.	d.
1.	4	12	$10\frac{1}{2}$
2.	13	12	$1\frac{1}{2}$
3.	10	6	$9\frac{1}{4}$
4.	10	2	6
5.	6	8	$3\frac{1}{4}$
6.	12	13	$7\frac{3}{4}$
7.	4	8	$2\frac{1}{4}$
8.	18	19	$11\frac{3}{4}$
9.	6	5	$0\frac{3}{4}$
10.	10	2	$2\frac{3}{4}$

118.

	£	s.	d.
1.	83	15	$10\frac{1}{4}$
2.	79	3	$11\frac{1}{4}$
3.	78	10	$11\frac{1}{4}$
4.	61	0	$9\frac{1}{2}$
5.	43	19	$0\frac{1}{4}$
6.	29	2	$11\frac{1}{4}$
7.	38	18	$1\frac{1}{2}$
8.	86	19	$11\frac{3}{4}$
9.	70	17	$11\frac{1}{2}$
10.	37	13	$9\frac{3}{4}$
11.	634	12	$2\frac{1}{4}$
12.	721	15	$10\frac{1}{2}$
13.	983	19	$1\frac{3}{4}$
14.	802	16	$7\frac{1}{2}$
15.	924	18	$2\frac{3}{4}$
16.	634	12	$7\frac{3}{4}$
17.	183	19	$4\frac{1}{4}$
18.	360	19	$2\frac{1}{4}$
19.	403	18	$1\frac{1}{2}$
20.	93	18	11

119.

	£	s.	d.
1.	56	1	$4\frac{1}{2}$
2.	81	15	$6\frac{1}{2}$
3.	49	6	$10\frac{3}{4}$
4.	99	18	$10\frac{1}{4}$
5.	67	5	$8\frac{3}{4}$
6.	132	6	$3\frac{1}{4}$
7.	185	17	$2\frac{3}{4}$
8.	218	12	$8\frac{1}{4}$
9.	63	12	$7\frac{3}{4}$
10.	52	8	$11\frac{1}{2}$
11.	537	14	$9\frac{1}{2}$
12.	618	5	$3\frac{3}{4}$
13.	427	12	$1\frac{1}{2}$
14.	801	17	$9\frac{1}{4}$
15.	358	17	$1\frac{1}{4}$
16.	189	14	$0\frac{1}{2}$
17.	163	0	$0\frac{3}{4}$
18.	280	15	$0\frac{1}{2}$
19.	563	18	$1\frac{3}{4}$
20.	209	19	$5\frac{1}{4}$

120.

	£	s.	d.
1.	13	12	$3\frac{1}{4}$
2.	68	2	$11\frac{3}{4}$
3.	51	12	10
4.	19	15	$0\frac{1}{2}$
5.	37	10	$8\frac{1}{4}$
6.	21	3	$7\frac{1}{2}$
7.	12	7	$10\frac{1}{4}$
8.	23	11	$2\frac{3}{4}$
9.	13	15	$8\frac{1}{2}$

121.

	£	s.	d.
1.	5	7	$6\frac{1}{2}$
2.	2	9	$2\frac{1}{4}$
3.	8	3	$1\frac{1}{2}$
4.	6	12	$7\frac{3}{4}$
5.	11	3	$5\frac{1}{2}$
6.	12	13	$1\frac{3}{4}$
7.	9	17	$8\frac{1}{2}$
8.	12	8	$11\frac{1}{4}$
9.	21	15	$1\frac{1}{4}$
10.	19	19	$11\frac{3}{4}$
11.	59	17	$3\frac{1}{4}$
12.	75	18	$1\frac{3}{4}$
13.	87	6	$6\frac{1}{2}$
14.	93	5	$11\frac{1}{4}$
15.	38	19	$9\frac{1}{2}$
16.	57	12	$8\frac{3}{4}$
17.	27	15	$8\frac{1}{2}$
18.	61	14	$3\frac{3}{4}$
19.	82	7	$11\frac{1}{2}$
20.	85	19	$11\frac{1}{4}$

122.

	£	s.	d.
1.	624	13	7
2.	802	14	9
3.	62	13	8½
4.	83	19	2
5.	49	11	2½
6.	531	12	1½
7.	639	9	9½
8.	318	9	11¾
9.	427	16	11
10.	872	3	9½
11.	119	14	7
12.	151	16	3½
13.	188	1	1¼
14.	373	3	9
15.	531	12	1½
16.	359	8	6½
17.	627	15	8½
18.	703	11	5½
19.	149	19	9½
20.	978	17	8¼

123.

	£	s.	d.
1.	8	17	3½
2.	15	2	5
3.	25	17	8
4.	83	12	1¼
5.	21	19	3½
6.	137	13	8
7.	206	15	2½
8.	198	16	9¼
9.	317	15	11½
10.	216	17	5¼

124.

	s.	d.
1.	19	3½
2.	11	5¾
3.		11¾
4.	15	8½
5.	9	11¾
6.	17	2¼
7.	18	9¼
8.	8	2¾
9.	14	6½
10.	13	9¼

125.

	£	s.	d.
1.	81	0	8½
2.	62	18	0¾
3.	70	19	3¼
4.	19	7	0¼
5.	32	0	10¼
6.	25	10	0½
7.	90	15	0½
8.	30	10	0¼
9.	17	0	0¾
10.	83	0	1¼
11.	34	0	0½
12.	340	0	9¾
13.	820	7	0½
14.	700	18	6¼
15.	2700	10	0½
16.	78	0	0¼
17.	160	13	0½
18.	80	7	2¼
19.	220	10	10¼
20.	390	0	11¼

126.

	£	s.	d.
1.	37	11	8¼
2.		4	3¾
3.		18	7¾
4.	17	14	3¾
5.	119	10	7¼
6.		2	1½
7.	10	14	2½
8.	312	15	2
9.			7½
10.	9	13	10

127.

1. 823.	11. 3070.
2. 734.	12. 1380.
3. 3046.	13. 2430.
4. 1832.	14. 78.
5. 3063.	15. 753.
6. 795.	16. 56.
7. 357.	17. 126.
8. 6037.	18. 144.
9. 7300.	19. 297.
10. 97.	20. 216.

128.

1. 832.
2. 95.
3. 64.
4. 140.
5. The 21st.
6. 1784.
7. 49.
8. 8, and £10 12*s.* 8*d.* remains.
9. The 83rd.
10. 29, and 2*s.* 1½*d.* change.
11. 32.
12. 80 times, and £2 16*s.* 8*d.* remains.
13. 75, and 13*s.* 1½*d.* remains.

129.

1. £50.
2. £42 16*s.* 3*d.*
3. £162 7*s.* 11½*d.*
4. £2414 5*s.* 10*d.*
5. £54 5*s.* 10½*d.*
6. £34 3*s.* 11½*d.*
7. (1) £128 3*s.* 3*d.* (2) £6664 9*s.*
8. £266 15*s.* 0*d.*
9. £9685 12*s.* 6*d.*
10. He loses £2 7*s.* 4½*d.*
11. 10*s.* 1½*d.*
12. £558 10*s.* 10*d.*
13. £103 13*s.* 1½*d.*
14. £1136 5*s.* 0*d.*
15. £300 18*s.* 3*d.*
16. 19*s.* 3*d.*
17. £27 17*s.* 11½*d.*
18. (1) £26 10*s.* (2) 17*s.* 8*d.*
19. 3*s.* 3*d.*
20. 2*s.* 10½*d.*
21. One has £2 2*s.* 6*d.*; the others £1 12*s.* 6*d.* each.
22. £6 7*s.* 6*d.*
23. £23 2*s.* 6*d.*
24. £6 12*s.* 6*d.*
25. £57 17*s.* 0*d.*
26. (1) £11 10*s.* 3*d.* (2) £95 18*s.* 9*d.*
27. £1 5*s.* 8½*d.*
28. 1*s.* 3*d.*
29. £9024 12*s.* 6*d.*
30. £471 19*s.* 2*d.*
31. (1) 174 12*s.* 6*d.* (2) 127 grs.
32. 263.
33. £1 2*s.* 6*d.*
34. 8*s.* 3½*d.*
35. £435 2*s.* 6*d.*

130.

1. 1058 ft.
2. 2720 in.
3. 34 p. 1 yd. 1 ft. 3 in.
4. 6380 yds.
5. 1196028 in.
6. 254 n.
7. 1185 n.
8. 1788 yds.
9. 3850 yds.
10. 3991860 in.
11. 35 yds. 2 ft. 11 in.
12. 187 m. 4 f. 31 p.
13. 2618880 n.
14. 3 m. 1 f. 17 yds. 2 ft.
15. 86 yds. 3 qrs. 1 n.
16. 317 ch.
17. 83 ch. 97 l.
18. 385 yds. 3 n.
19. 1 m. 2 f. 83 yds. 1 ft. 4 in.
20. 7 m. 30 yds. 10 in.

131.

1. 423 cwt.
2. 1764 lbs.
3. 1419 oz.
4. 1315 drs.
5. 1348 oz.
6. 1112835 oz.
7. 42324 lbs.
8. 545536 drs.
9. 15 oz. 15 drs.
10. 3 qrs. 8 oz.
11. 23 lbs. 12 oz. 7 drs.
12. 19 cwt. 13 lbs.
13. 13 lbs. 13 oz. 13 drs.
14. 34 t. 1 qr. 5 oz.
15. 2 qrs. 12 oz. 8 drs.
16. 482 t. 1 qr. 10 lbs.

132.

1. 1488 drs.
2. 130 sc.
3. 5260 grs.
4. 218 sc.
5. 397 grs.
6. 1 oz. 3 drs. 1 sc. 17 grs.
7. 84 lbs. 9 oz. 6 drs.
8. 11 oz. 7 drs. 19 grs.
9. 6 lbs. 3 drs. 1 sc. 17 grs.
10. 21 lbs. 12 grs.

133.

1. 62 dwts.
2. 1659 dwts.
3. 478128 grs.
4. 36982 grs.
5. 4579 dwts.
6. 10 lbs. 6 oz. 19 dwts.
7. 11 oz. 10 dwts. 3 grs.
8. 1348 lbs. 9 oz. 17 dwts. 13 grs.
9. 999 lbs. 9 oz. 9 dwts.
10. 130 lbs. 13 dwts.

134.

1. 600 hrs.
2. 42120 min.
3. 9388 min.
4. 31919 secs.
5. 1987221 secs.
6. 340 d. 23 hrs.
7. 104 w. 4 d. 2 hrs. 2 min.
8. 1095 d.
9. 51 w. 6 d. 23 hrs. 59 min.

135.

1. 872 gals.
2. 3056 pts.
3. 4101 qts.
4. 289 pts.
5. 1027 pks.
6. 11 bush. 2 pks. 1 gal. 2 qts.
7. 11 qrs. 7 bush. 1 gal.
8. 32 qrs. 1 bush. 3 pks. 1 gal. 3 qts.
9. 7 bush. 1 gal. 3 qts. 1 pt.
10. 72 qrs. 3 bush. 3 qts.

136.

1. 231 pts.
2. 1287 gills.
3. 636 qts.
4. 496 qts.
5. 1824 gills.
6. 30 gals. 3 qts. 1 pt.
7. 29 gals. 3 qts. 3 gills.
8. 2 hhds. 30 gals. 1 qt.
9. 2 hhds. 51 gals. 1 qt.
10. 50 gals. 3 qts. 1 gill.

137.

1. 1165 min.
2. 3419 min.
3. 2280 min.
4. 6 oz. 3 drs. 52 min.
5. 13 oz. 12 min.
6. 53 oz. 7 drs.

138.

1. 20550 in.
2. 10437 in.
3. 45216 in.
4. 792 p.
5. 8975 p.
6. 2320 p.
7. 5 a. 2 r. 21 p.
8. 37 a. 15 p.
9. 135 a. 3 r. 39 p.
10. 3 yds. 6 ft. 59 in.
11. 31 yds. 134 in.
12. 175 yds. 6 ft.

139.

1. 9612 ft.
2. 25929 in.
3. 4706353 in.
4. 2941049 in.
5. 5 ft. 637 in.
6. 757 yds. 2 ft.
7. 2 yds. 26 ft. 1152 in.
8. 3 yds. 5 ft. 334 in.

140.

1. 4609 yds.
2. 133 p. 4 yds. 1 ft. 6 in.
3. 50 p. 4 yds.
4. 242 ft.
5. 372 p. 5 yds. 6 in.
6. 41 n. $\frac{2}{4}$ in.
7. 1656 in.
8. 204$\frac{3}{4}$ in.
9. 2178 yds.
10. 236 p.
11. 2 p. 13 yds. 4 ft.
12. 68 lbs. 13 dwts. 8 grs.
13. 3 lbs.

141.

1. 51 t. 6 cwt.
2. 16 cwts. 2 lbs.
3. 27 lbs. 12 oz. 4 drs.
4. 96 t. 6 cwt. 2 qrs. 10 lbs.
5. 2 t. 15 cwt. 20 lbs. 10 oz.
6. 71 t. 8 cwt. 1 qr. 16 lbs.

142.

1. 70 lbs. 10 oz. 10 dwt.
2. 3 lbs. 6 oz. 4 dwt. 10 grs.
3. 52 lbs. 10 oz. 14 dwt. 16 grs.
4. 111 lbs. 5 oz. 2 dwt. 18 grs.
5. 176 lbs. 9 oz. 14 grs.
6. 167 lbs. 7 oz. 8 dwt. 23 grs.

143.

1. 1 lb. 1 oz. 1 sc. 4 grs.
2. 17 lbs. 5 oz. 4 drs. 1 sc.
3. 204 lbs. 8 oz. 6 drs. 1 sc.
4. 251bs. 7 oz. 7drs. 1sc. 13grs.
5. 26 lbs. 8 oz. 7 drs. 16 grs.
6. 28 lbs. 1 oz. 2 sc. 16 grs.

144.

1. 160 m. 1 f. 30 p.
2. 45 yds. 2 ft. 4 in.
3. 105 m. 5 f. 18 p.
4. 79 yds. 2 ft. 8 in.
5. 105 m. 6 f. 10 p.
6. 76 yds. 2 ft. 1 in.

145.

1. 75 yds. 3 qrs. 1 n.
2. 220 yds. 1 qr.
3. 245 yds. 3 qrs. 3 n.
4. 228 yds. 1 n.
5. 136 yds. 1 qr. 1 n.
6. 546 yds. 3 n.

146.

1. 25 w. 2 d. 7 hrs. 32 min.
2. 16 hrs. 51 m. 18 sec.
3. 33 hrs. 45 sec.
4. 53 w. 3 d. 5 hrs.
5. 17 d. 10 hrs. 26 min. 15 sec.
6. 53 hrs. 42 min. 52 sec.

147.

1. 34 yds. 4 ft. 94 in.
2. 164 yds. 3 ft. 68 in.
3. 105 a. 2 r. 17 p.
4. 136 a. 7 p.
5. 270 a. 3 r. 17 p.
6. 26 yds. 6 ft. 117 in.

148.

1. 301 yds. 2 ft. 531 in.
2. 124 yds. 24 ft. 1461 in.
3. 721 yds. 25 ft. 705 in.
4. 408 yds. 14 ft. 1333 in.

149.

1. 64 qrs. 7 bus. 3 pks.
2. 28 qrs. 4 bus. 1 pk. 2 qrts.
3. 8 pks. 1 gal. 1 qrt. 1 pt. 1 gill.
4. 435 qrs. 7 bus. 2 pks.
5. 4 gals. 1 qrt. 1 pt. 3 gills.

150.

1. 129 gals. 3 qrts. 1 pt. 2 gills
2. 53 gals. 3 qrts. 2 gills.
3. 66 gals. 1 qrt. 2 gills.
4. 198 gals. 1 qrt. 2 gills.

151.

1. 6 cwt. 9 lbs.
2. 2 lbs. 2 oz. 18 dwts. 22 grs.
3. 1 a. 3 r. 32 p.
4. 7 m. 0 f. 8 p.
5. 1 min. past 6 o'clock.
6. 38 ch. 48 l.

152.

1. 2 t. 18 cwt. 2 qrs.
2. 3 t. 8 cwt. 2 qrs. 22 lbs.
3. 2 t. 12 cwt. 2 qrs. 23 lbs.
4. 2 lbs. 15 oz. 2 drs.
5. 10 lbs. 5 oz. 15 drs.
6. 22 lbs. 3 oz. 13 drs.

153.

1. 1 lb. 10 oz. 4 dwts.
2. 1 lb. 11 oz. 10 dwts.
3. 8 oz. 12 grs.
4. 3 lbs. 10 oz. 16 dwts. 14 grs.
5. 18 lbs. 10 oz. 2 dwts. 23 grs.
6. 6 lbs. 6 oz. 11 dwts. 9 grs.

154.

1. 4 lbs. 2 sc.
2. 6 lbs. 6 oz. 4 drs. 2 sc. 8 grs.
3. 16 lbs. 9 oz. 1 sc. 9 grs.
4. 3 oz. 1 dr. 1 sc. 18 grs.
5. 1 lb. 1 oz. 6 drs. 1 sc. 18 grs.
6. 10 lbs. 4 oz. 4 drs. 2 sc. 5 grs.

155.

1. 12 m. 3 f. 31 p.
2. 7 yds. 1 ft. 3 in.
3. 7 yds. 9 in.
4. 38 yds. 5 in.
5. 77 m. 7 f. 4 p.
6. 251 m. 9 p.

156.

1. 4 yds. 3 qrs. 1 n.
2. 12 yds. 1 qr. 3 n.
3. 13 yds. 1 qr. 3 n.
4. 22 yds. 3 n.
5. 44 yds. 1 qr. 2 n.
6. 10 yds. 2 qrs. 2 n.

157.

1. 118 a. 2 r. 34 p.
2. 368 a. 2 r. 36 p.
3. 11 a. 38 p.
4. 4 yds. 7 ft. 24 in.
5. 4 yds. 6 ft. 143 in.
6. 11 yds. 1 ft. 26 in.

158.

1. 41 yds. 20 ft. 240 in.
2. 14 yds. 19 ft. 1703 in.
3. 16 yds. 7 ft. 1495 in.
4. 135 yds. 23 ft. 1628 in.
5. 474 yds. 14 ft. 392 in.
6. 28 yds. 6 ft. 381 in.

159.

1. 7 bus. 3 pks.
2. 8 qrs. 6 bus. 2 pks.
3. 10 qrs. 5 bus. 3 pks.
4. 1 bus. 3 pks. 1 qt.
5. 3 bus. 1 gal. 1 qt. 1 pt.
6. 1 bus. 2 qts.

160.

1. 3 gals. 3 qts. 1 pt.
2. 12 gals. 2 qts.
3. 7 gals. 1 pt. 1 gill.
4. 13 gals. 1 pt. 3 gills.
5. 21 gals. 2 qts. 1 pt. 1 gill.
6. 10 gals. 3 gills.

161.

1. 14 gals. 3 qts. 2 gills.
2. 28 lbs. 14 oz.
3. 7 m. 4 f. 26 p.
4. 24 lbs.
5. 6 hrs. 39 min.
6. 4 m. 2 f. 34 p.
7. 186 a. 1 r. 28 p.
8. 1 cwt. 2 qrs. 24 lbs. 3 oz.
9. 7 cwt. 3 qrs. 26 lbs.

162.

1. 377 m. 6 f. 17 p.
2. 289 m. 4 f. 15 p.
3. 84 yds. 2 ft. 7 in.
4. 302 yds. 1 ft.
5. 278 m. 4 f. 4 p.
6. 2845 m. 3 f. 19 p.
7. 98 yds. 8 in.
8. 34 yds.

163.

1. 324 yds. 1 qr. 2 n.
2. 47 yds. 1 qr.
3. 240 yds. 1 qr.
4. 765 yds. 2 qrs. 2 n.
5. 1326 yds.
6. 18030 yds. 1 qr. 2 n.

164.

1. 17 t. 12 cwt. 2 qrs.
2. 489 t. 10 cwt. 2 qrs. 24 lbs.
3. 9 t. 11 cwt. 3 qrs. 18 lbs.
4. 4 t. 12 cwt. 19 lbs.
5. 120 t. 16 cwt. 2 qrs. 15 lbs.
6. 2515 t. 15 cwt. 1 qr. 2 lbs.
7. 72 t. 7 cwt. 23 lbs.
8. 67 t. 5 cwt. 1 qr. 4 lbs.

165.

1. 46 lbs. 2 oz. 1 dwt.
2. 1 lb. 4 oz. 9 dwt. 4 grs.
3. 7 lbs. 6 oz. 5 dwt. 10 grs.
4. 25 lbs. 2 oz. 7 dwt. 16 grs.
5. 739 lbs. 6 oz. 19 dwt. 3 grs.
6. 5349 lbs. 10 oz. 10 dwt.
7. 184 lbs. 6 oz. 15 dwt. 8 grs.
8. 645 lbs. 4 oz. 12 dwt. 16 grs.

166.

1. 25 lbs. 9 oz.
2. 2 lbs. 4 oz. 7 drs. 1 sc. 4 grs.
3. 24 lbs. 9 oz. 4 drs.
4. 1 lb. 4 oz. 1 dr. 2 sc. 14 grs.
5. 5831 lbs. 10 oz. 4 drs.
6. 357 lbs. 11 oz. 1 sc. 19 grs.
7. 1683 lbs. 2 oz. 3 drs. 1 sc.
8. 1318 lbs. 9 oz. 3 drs. 1 sc. 12 grs.

167.

1. 1536 a. 3 r. 15 p.
2. 3042 a. 3 r. 7 p.
3. 440 yds. 72 in.
4. 126 yds. 8 ft. 85 in.
5. 4840 a. 3 r.
6. 8301 a. 2 r. 13 p.
7. 11217 yds. 5 ft. 88 in.
8. 11983 yds. 8 ft. 132 in.

168.

1. 2469 yds. 1300 in.
2. 950 yds. 21 ft. 585 in.
3. 565 yds. 25 ft. 1338 in.
4. 150596 yds. 20 ft. 1384 in
5. 50118 yds. 3 ft. 1428 in.
6. 5721 yds. 8 ft. 1285 in.

169.

1. 18 w. 8 hrs. 24 min.
2. 8 w. 1 d. 11 hrs. 33 min. 27 sec.
3. 9 w. 2 d. 16 hrs. 22 min. 48 sec.
4. 7 yrs. 35 w. 5 d. 3 hrs. 45 min.
5. 1 w. 5 d. 6 hrs. 48 min. 53 sec.
6. 43 w. 15 hrs. 24 min. 44 sec.
7. 29 w. 1 d. 17 hrs. 12 min. 27 sec.
8. 19 w. 5 d. 4 hrs. 15 min. 18 sec.

170.

1. 716 qrs. 2 bush.
2. 72 qrs. 4 bush.
3. 164 qrs. 3 bush.
4. 31 qrs. 5 bush. 3 pks.
5. 26146 qrs. 1 bush.
6. 8 qrs. 1 pk. 1 gal. 2 qts. 1 pt.
7. 22341 qrs. 4 bush. 3 pks.
8. 9564 qrs. 3 bush. 3 pks. 1 gal.

171.

1. 1540 gals. 1 pt.
2. 4567 gals. 2 qts.
3. 924 gals. 1 pt. 2 gills.
4. 1722 gals. 1 qt. 1 pt. 3 gills.
5. 29426 gals. 1 qt.
6. 767 gals. 2 qts. 1 pt. 2 gills.
7. 42010 gals. 3 qts. 1 pt. 2 gills.
8. 15743 gals. 1 qt. 3 gills.

172.

1. 121 t. 19 cwt. 2 qrs.
2. 279 m. 5 f. 29 p.
3. 621 yds.
4. 2 lbs. 1 oz. 12 dwts. 12 grs.
5. 17 min. 2 sec.
6. 10 lbs. 2 oz. 15 dwt.
7. 111 d. 12 hrs. 40 min.
8. (1) 1 qr. 9 lbs. 14 oz.
(2) 1 cwt. 26 lbs. 1 oz. 6 drs.
9. 102 sq.yds. 3 sq.ft. 132 sq. in.
10. 152 c. yds.
11. 79 a. 2 r. 20 p.

173.

1. 5 m. 7 f. 33 p.
2. 12 m. 31 p.
3. 54 m. 3 f. 5 p.
4. 5 yds. 2 ft. 10 in.
5. 17 yds. 2 ft. 11 in.
6. 32 yds. 1 ft. 9 in.

174.

1. 15 yds. 3 qrs. 2 n.
2. 78 yds. 1 qr. 3 n.
3. 32 yds. 1 qr. 2 n.
4. 173 yds. 2 qrs. 1 n.
5. 520 yds. 2 qrs. 2 n.
6. 309 yds. 2 qrs. 1 n.

175.

1. 5 t. 13 cwt. 1 qr.
2. 13 t. 2 qrs. 3 lbs.
3. 17 cwt. 3 qrs. 21 lbs.
4. 52 t. 18 cwt. 27 lbs.
5. 25 lbs. 15 oz. 12 drs.
6. 3 qrs. 5 lbs. 11 oz.

176.

1. 15 lbs. 3 oz. 7 dwts.
2. 41 lbs. 10 oz. 15 dwts.
3. 6 oz. 14 dwts. 16 grs.
4. 57 lbs. 9 oz. 13 dwts. 9 grs.
5. 63 lbs. 10 oz. 5 dwts. 3 grs.
6. 13 lbs. 7 oz. 14 dwts. 18 grs.

177.

1. 1 oz. 4 drs. 14 grs.
2. 5 lbs. 3 oz. 7 drs. 1 sc.
3. 16 lbs. 10 oz. 5 drs. 2 sc.
4. 37 lbs. 5 oz. 3 drs. 1 sc.
5. 3 oz. 7 drs. 2 sc. 11 grs.
6. 38 lbs. 11 oz. 6 drs.

178.

1. 67 a. 2 r. 31 p.
2. 307 a. 1 r. 15 p.
3. 419 a. 34 p.
4. 74 yds. 8 ft. 112 in.
5. 83 yds. 1 ft. 130 in.
6. 692 yds. 3 ft. 38 in.

179.

1. 73 yds. 13 ft. 114 in.
2. 809 yds. 26 ft. 576 in.
3. 47 yds. 3 ft. 591 in.
4. 834 yds. 25 ft. 1300 in.
5. 137 yds. 13 ft. 864 in.
6. 631 yds. 12 ft. 300 in.

180.

1. 86 qrs. 7 bush. 3 pks.
2. 70 qrs. 5 bush. 2 pks. 1 gal.
3. 7 bush. 3 pks. 1 gal. 3 qts.
4. 2 pks. 3 qts. 1 pt.
5. 2 pks. 2 qts. 1 pt.
6. 35 qrs. 5 bush. 3 pks. 1 gal.

181.

1. 6 d. 6 hrs. 31 min.
2. 2 w. 4 d. 3 hrs. 55 min.
3. 3 w. 4 d. 3 hrs. 55 m.
4. 14 hrs. 33 min. 22 sec.
5. 23 hrs. 58 min. 15 sec.
6. 15 hrs. 31 min. 30 sec.

182.

1. 21 m. 3 f. 20 p.
2. 1 pt. 2 gills.
3. 1 r. 39 p.
4. 7 oz. 12 drs.
5. 2 yds. 3 qrs. 2 n.
6. 2 oz. 12 dwts. 12 grs.
7. 35 m. 3 f. 20 p.
8. 1 oz. 14 drs.
9. 13 gals. 2 qts. 1 pt.
10. 1 t. 13 cwt. 2 qrs.

183.

1. 17 m. 5 f. 13 p.
2. 39 m. 6 f. 35 p.
3. 78 m. 37 p.
4. 18 yds. 1 ft. 8 in.
5. 24 yds. 10 in.
6. 70 yds. 2 ft. 9 in.

184.

1. 58 t. 13 cwt. 3 qrs.
2. 87 t. 17 cwt. 1 qr.
3. 63 t. 10 cwt. 1 qr.
4. 8 t. 5 cwt. 3 qrs. 14 lbs.
5. 15 cwt. 13 lbs. 8 oz.
6. 8 cwt. 3 qrs. 1 lb.

185.

1. 21 lbs. 6 oz. 13 dwt.
2. 30 lbs. 10 oz. 8 dwt.
3. 59 lbs. 8 dwt.
4. 43 lbs. 7 oz. 19 dwt. 10 grs.
5. 80 lbs. 7 oz. 13 dwt. 12 grs.
6. 135 lbs. 11 oz. 17 dwt. 15 grs.

186.

1. 14 lbs. 1 oz. 5 drs.
2. 200 lbs. 3 oz. 5 drs. 1 sc.
3. 316 lbs. 9 oz. 4 drs.
4. 730 lbs. 8 oz. 7 drs.
5. 162 lbs. 6 drs. 1 sc. 15 grs.
6. 193 lbs. 5 oz. 10 grs.

187.

1. 58 a. 3 r. 17 p.
2. 672 a. 35 p.
3. 180 a. 30 p.
4. 3 r. 39 p.
5. 3 sq. yds. 7 sq. ft. 89 sq. in.
6. 15 sq. yds. 6 sq. ft. 109 sq. in.

188.

1. 15 c. yds. 20 c. ft.
2. 39 c. yds. 20 c. ft. 600 c. in.
3. 584 c. yds. 1231 c. in.
4. 637 c. yds. 5 c. ft. 736 c. in.
5. 300 c. yds. 20 c. ft. 1000 c. in.
6. 132 c. yds. 317 c. in.

189.

1. 8 gals. 3 qts. 1 pt.
2. 2 qts. 1 pt.
3. 82 gals. 1 pt. 3 gills.
4. 103 gals. 3 qts. 2 gills.
5. 50 gals. 1 qt. 3 gills.
6. 3 qts. 3 gills.

190.

1. 16 d. 13 hrs. 27 min.
2. 9 d. 23 hrs. 32 min. 30 sec
3. 17 hrs. 12 min. 40 sec.
4. 43 d. 20 min. 19 sec.
5. 22 hrs. 51 min. 35 sec.
6. 59 min. 48 sec.

191.

1. 1 t. 17 cwt. 3 qrs.
2. 10 m. 2 f. 15 p.
3. 2 yds. 2 ft. 11 in.
4. 1 cwt. 2 qrs. 13 lbs.
5. (1) 1 min. 12 sec. per day.
(2) 3 sec. per hour.
6. 4 oz. 14 drs.
7. 13 grs.
8. 2 gals. 1 pt. 2 gills.
9. 1 lb. 13 oz.
10. 12 ft. 4 in.

192.

1. 136.
2. 19.
3. 9.
4. 35.
5. 346.
6. 732.
7. 3076.
8. 197.
9. 1392.
10. 648.
11. 430.
12. 1837.
13. 89.
14. 68.
15. 831.
16. 23.
17. 3864.
18. 7300.
19. 231.
20. 5367.

193.

1. 6400.
2. 48.
3. 15.
4. 12.
5. 23.
6. 561.
7. 168.
8. 40 times, and 4 oz. 5 dwt. remains.
9. 77 lots, and 25 p. over.
10. 228.

194.

1. 2 f. 3 p. 2 ft. 7 in.
2. 1 f. 17 p. 1 yd. 2 in.
3. 24 yds. 1 qr. $\frac{1}{4}$ in.
4. 29 yds. 2 qrs. 1 n. 2 in.
5. 45 a. 33 p. 11 yds.
6. 26 p. 2 yds. 1 ft. 7 in.

195.

1. 11 p. 4 yds. 2 ft. 2 in.
2. 2 p. 3 yds. 8 in.
3. 4 a. 2 r. 7 p. 25 sq. yds. 4 sq. ft. 42 sq. in.
4. 6 p. 2 sq. yds. 8 sq. ft. 121 sq. in.
5. 34 yds. 2 qrs. 3 n. $1\frac{1}{2}$ in.
6. 24 yds. 2 qrs. 1 n. $\frac{1}{2}$ in.

196.

1. 3 m. 7 f. 35 p. 1 yd. 1 ft. 6 in.
2. 353 m. 3 f. 12 p. 4 yds.
3. 602 yds. 3 qrs. 3 n. $1\frac{1}{2}$ in.
4. 412 yds. 3 n.
5. 566 a. 23 p. 24 sq. yds. 5 sq. ft. 44 sq. in.
6. 4470 a. 1 r. 10 p. 1 yd. 6 ft. 135 in.

197.

1. 8 p. 5 yds. 1 ft.
2. 13 p. 3 yds. 2 ft. 6 in.
3. 82 yds. 3 qrs. 2 n. 2 in.
4. 53 yds. 3 n. $1\frac{1}{2}$ in.
5. 4 a. 3 r. 4 p. 30 yds. 108 in.
6. 8 p. 12 sq. yds. 3 sq. ft.
7. 17 p. 4 yds. 2 ft. 3 in.
8. 31 yds. 2 qrs. 3 n. 1 in.

198.

1. 24 yds. 2 qrs. 2 n.
2. 270.
3. 17 lbs. 3 dwts. 8 grs.
4. 12 m. 7 f. 44 yds.
5. 92 a. 37 p.
6. 3 m. 1 f.
7. 1 t. 2 qrs. 16 lbs. 8 oz.
8. 2 qrs. 6 lbs.
9. 107 yds. 5 ft. 68 in.
10. 7 cwt. 3 qrs. 24 lbs.
11. 6272640 sq. in.
12. 18 st. 7 lbs.
13. 61 gals. 2 qts. 1 pt.
14. 1 t. 12 cwt. 1 qr. 13 lbs.
15. 190080.
16. 3 c. yds. 13 c. ft. 1072 c. in.
17. 10 lbs. 8 oz.
18. 2 m. 4 f. 26 p.

19. 3 t. 7 cwt. 1 qr. 14 lbs.
20. 17 min.
21. 53 m.
22. 7 f. 3 p. 4 yds. 6 in.
23. 5 d. 9 hrs. 24 min.
24. 1240 grs.
25. 982 ch.
26. 16 gals. 3 qts. 1 pt.
27. 13675520 a.
28. 231 m. 5 f.
29. 5 m. 2 f. 60 yds.
30. 679000 grs.
31. 7 oz. 14 dwts. 12 grs.
32. £9 12*s.* 8*d.*
33. 18150.
34. 1512000.
35. 4 f. 46 yds.
36. £3 13*s.* 2*d.*
37. 320.
38. 2 yds. 8 in.
39. 55.
40. £11.
41. 64.
42. £211 7*s.* 4*d.*
43. 57863 yrs. 5 days.
44. 3 m. 5 f. 28 yds.
45. 23 m. 5 f. 86 yds. 2 ft.
46. 2 qrs. 19 lbs. 8 oz.
47. 7 gals. 2 qts.
48. 4480.
49. 13 lbs. 11 oz.
50. 8 oz. 5 dwts. 12 grs.
51. 11700.
52. 1062 t. 18 cwt. 3 qrs. 20 lbs.
53. £16 6*s.* 9*d.*
54. 605.
55. 50 m. 1 f. 31 p.
56. 124000.
57. 561024.
58. 352000.
59. 63 d. 21 hrs. 20 min.
60. 64000.
61. 13 cwt. 2 qrs. 14 lbs.
14 cwt. 1 qr. 14 lbs.
62. (1) 15 min. 21 secs.
(2) 3 hrs. 19 min. 33 secs.
63. £136 13*s.*
64. 432 t. 18 cwt.
65. 13411980 m.
66. 1868.
67. 2912.
68. 39 yds. 3 qrs.
69. 1856 drs.
70. 17 m. 2 f. 82 yds.
71. 2 sc. 10 grs.
72. 315 days.
73. 1 r. 20 p.
74. 4 a. 7 p.
75. 9 dwts. 7 grs.
76. 26 lbs.
77. (1) 136 gals. 3 qts. 1 pt.
(2) £13 13*s.* 9*d.*
78. 11 cwt. 3 qrs. 9 lbs.

PART III.

199.

	£	*s.*	*d.*
1.	95	3	9
2.	133	11	10½
3.	10	15	6½
4.	4	11	10½
5.	66	19	3¾
6.	8	6	1¾
7.	41	19	4¾
8.	19	1	1
9.	365	13	3¾
10.	137	16	3

200.

	£	*s.*	*d.*
1.	9	5	6
2.	267	6	0
3.	125	16	3
4.	3111	10	2
5.	457	10	0
6.	163	4	7½
7.	282	17	6
8.	5386	15	9
9.	1504	10	8
10.	620	17	7½

201.

	£	*s.*	*d.*
1.	311	10	0
2.	540	15	0
3.	4593	12	0
4.	1978	7	6
5.	433	16	8
6.	14425	6	8
7.	232	10	0
8.	565	2	6
9.	1171	5	0
10.	1510	8	4

202.

	£	s.	d.
1.	39	7	9
2.	132	3	4
3.	968	5	9
4.	306	13	7
5.	262	11	0
6.	378	14	8
7.	3730	12	1
8.	409	13	8
9.	3807	5	10
10.	849	2	$1\frac{3}{4}$

203.

	£	s.	d.
1.	1878	15	0
2.	1007	8	0
3.	4310	4	0
4.	7256	5	0
5.	2197	2	6
6.	3238	19	0
7.	17440	16	0
8.	4707	10	0
9.	1237	5	0
10.	1340	12	6

204.

	£	s.	d.
1.	149	9	$9\frac{1}{2}$
2.	312	16	$8\frac{1}{2}$
3.	471	8	$7\frac{1}{2}$
4.	239	9	7
5.	48	18	$2\frac{1}{2}$
6.	337	16	$1\frac{3}{4}$
7.	630	13	$1\frac{1}{2}$
8.	110	10	$6\frac{1}{2}$
9.	780	1	$9\frac{3}{4}$
10.	1288	10	$2\frac{1}{4}$

205.

	£	s.	d.
1.	716	7	6
2.	733	13	0
3.	1074	7	6
4.	487	16	0
5.	909	1	6
6.	545	4	0
7.	2543	12	6
8.	894	12	0
9.	200	11	6
10.	3479	12	8

206.

	£	s.	d.
1.	200	2	0
2.	910	0	0
3.	23053	13	4
4.	11774	14	6
5.	4662	19	0
6.	1634	3	4
7.	16780	8	4
8.	3083	13	4
9.	5637	6	0
10.	52699	14	6

207.

	£	s.	d.
1.	327	15	$9\frac{1}{2}$
2.	262	7	$2\frac{1}{4}$
3.	397	19	1
4.	2216	17	$9\frac{3}{4}$
5.	542	5	$0\frac{1}{2}$
6.	10828	16	0
7.	2246	11	9
8.	7066	16	8
9.	931	14	6
10.	2106	9	0

208.

	£	s.	d.
1.	4376	3	7
2.	3863	0	$4\frac{3}{4}$
3.	1609	11	$10\frac{1}{2}$
4.	1933	10	9
5.	2220	19	$6\frac{1}{4}$
6.	3353	3	$4\frac{1}{4}$
7.	211	9	6
8.	2325	9	$4\frac{1}{2}$
9.	10705	19	$9\frac{1}{2}$
10.	10331	18	$0\frac{3}{4}$
11.	1923	15	$4\frac{1}{4}$
12.	7229	13	4
13.	557	15	$7\frac{1}{2}$
14.	166	6	$1\frac{3}{4}$
15.	2632	5	3
16.	11540	0	$6\frac{1}{4}$
17.	214	1	1
18.	3852	19	7
19.	2028	15	0
20.	522	11	$0\frac{3}{4}$

209.

	£	s.	d.
1.	49	15	$10\frac{1}{2}$
2.	79	15	$8\frac{1}{4}$
3.	23	8	9
4.	10	19	$10\frac{1}{4}$
5.	3	0	$2\frac{3}{4}$

210.

	£	s.	d.
1.	3	7	$1\frac{3}{4}$
2.	15	12	$7\frac{1}{2}$
3.	26	9	$1\frac{1}{2}$
4.	15	9	$10\frac{1}{2}$
5.	19	6	0
6.	8	15	$4\frac{1}{2}$

211.

	£	s.	d.
1.	10	0	$6\frac{1}{4}$
2.	4	15	10
3.	2	2	0
4.		7	$8\frac{1}{4}$
5.	13	0	4

212.

	£	s.	d.
1.	2	3	1
2.	30	19	9
3.	2	11	5¾
4.	18	2	2¼
5.	2	12	3¼
6.	6	1	11

213.

	£	s.	d.
1.	5	14	0½
2.	3	13	11¾
3.		13	6¾
4.	33	13	7¾
5.	23	17	7¾
6.	15	17	9¾

214.

	£	s.	d.
1.	44	18	5¼
2.	7	19	9
3.	3	14	4½
4.	96	6	9
5.	11	4	3
6.	209	0	0
7.	45	0	0

215.

	£	s.	d.
1.	4	1	8
2.	5	5	5
3	44	0	11
4.	3	11	0¼
5.	12	0	4

216.

	£	s.	d.
1.	5	19	9½
2.	14	17	1
3.	19	19	11½
4.	9	1	3¼
5.	19	7	1½

217.

	£	s.	d.
1.	9	7	10
2.	11	4	10½
3.	2	5	0
4.	37	9	9½
5.	5	6	4½
6.	35	1	9¾

218.

	£	s.	d.
1.	14	19	7½
2.	2	10	9½
3.	19	6	9
4.	21	6	5½
5.	172	6	4½

219.

	£	s.	d.
1.	193	7	6
2.	329	14	3½
3.	5	11	6¼
4.	21	7	5
5.	24	9	4½
6.	36	16	10½
7.	50	14	8¾
8.	119	14	2
9.	306	9	3½
10.	45	10	5

220.

	£	s.	d.
1.	214	13	2½
2.	54	6	3
3.	8	16	7½
4.	13	14	2¼
5.	28	1	5½
6.	2	7	10¾
7.	495	19	5¾
8.	8	6	2¾
9.	12	16	10
10.	114	12	2

221.

	s.	d.
1.	8	5
2.	10	4½
3.	10	9
4.	10	7
5.	19	0

222.

	£	s.	d.
1.	1	0	5
2.	1	6	0
3.	1	5	5
4.	2	13	3½
5.	1	14	0½
6.	1	0	5
7.	2	14	5½
8.	3	18	7
9.	1	0	2½
10.	1	4	8½
11.	1	15	10
12.	1	1	10½
13.		19	4½
14.	4	1	1
15.	11	5	0
16.	11	18	6
17.	5	11	3
18.	17	0	1
19.	17	14	0
20.	4	9	6
21.	1	0	1½
22.	5	5	3
23.	1	12	6
24.	28	13	6
25.		18	1½
26.	2	11	4½
27.	21	13	9½
28.	2	13	4½
29.	2	15	5
30.	5	6	6
31.	19	3	1½
32.	1	17	7
33.	9	0	4½
34.	3	2	8
35.	5	7	11½

223.

1. 31.
2. 54.
3. 17.
4. 231.
5. 12.
6. 261.
7. 9.
8. 137.
9. 43.
10. 97.
11. 62.
12. 317.
13. 8.
14. 137.
15. 13.
16. 51.
17. 21.
18. 78.
19. 9.
20. 7.

224.

1. 24.
2. 13.
3. 103.
4. 17.
5. 7.

225.

1. 180.
2. 480.
3. 1890.
4. 112.
5. 576.
6. 252.
7. 3300.
8. 936.
9. 1008.
10. 7920.
11. 864.
12. 2520.
13. 2730.
14. 3024.
15. 3276.
16. 4320.
17. 1140.
18. 86432.
19. 7140.

226.

1. $2\frac{1}{4}$, $3\frac{1}{6}$, $2\frac{2}{5}$, $7\frac{3}{12}$.
2. $4\frac{5}{8}$, $8\frac{3}{7}$, $31\frac{1}{3}$, $67\frac{1}{3}$.
3. $22\frac{3}{4}$, $54\frac{4}{11}$, $63\frac{7}{10}$, $81\frac{1}{5}$.
4. $5\frac{7}{12}$, $5\frac{1}{13}$, $8\frac{3}{17}$, $27\frac{21}{23}$.
5. $20\frac{19}{20}$, $75\frac{88}{100}$, $65\frac{60}{127}$.
6. $86\frac{178}{233}$, $88\frac{187}{211}$, $112\frac{74}{93}$.
7. $85\frac{448}{707}$, $89\frac{277}{307}$, $127\frac{287}{317}$.
8. $158\frac{102}{683}$, $1609\frac{9}{47}$, $11\frac{9041}{11818}$.

227.

1. $\frac{17}{7}$, $\frac{5}{4}$, $\frac{74}{6}$, $\frac{99}{8}$.
2. $\frac{91}{5}$, $\frac{58}{11}$, $\frac{145}{9}$, $\frac{193}{20}$.
3. $\frac{44}{10}$, $\frac{100}{19}$, $\frac{78}{100}$, $\frac{301}{20}$.
4. $\frac{2672}{15}$, $\frac{16918}{21}$, $\frac{2188}{21}$.
5. $\frac{18805}{100}$, $\frac{17135}{99}$, $\frac{2007}{27}$.
6. $\frac{10442}{101}$, $\frac{2468}{231}$, $\frac{6040}{2007}$.
7. $\frac{2037}{1677}$, $\frac{69007}{1000}$, $\frac{14981}{18}$.
8. $\frac{7027}{77}$, $\frac{62072}{1031}$, $\frac{6213847}{331}$.

228.

1. $\frac{7}{9}$, $\frac{4}{5}$, $\frac{1}{2}$.
2. $\frac{5}{7}$, $\frac{2}{7}$, $\frac{5}{7}$.
3. $\frac{2}{10}$, $\frac{1}{11}$, $\frac{11}{14}$.
4. $\frac{7}{8}$, $\frac{1}{8}$, $\frac{1}{100}$.
5. $\frac{13}{16}$, $\frac{3}{4}$, $\frac{7}{91}$.
6. $\frac{13}{15}$, $\frac{1}{3}$, $\frac{3}{213}$.
7. $\frac{3}{5}$, $\frac{7}{8}$, $\frac{13}{28}$.
8. $\frac{2}{3}$, $\frac{5}{7}$, $\frac{17}{42}$.
9. $\frac{34}{41}$, $\frac{13}{33}$, $\frac{1}{3}$.
10. $\frac{9}{25}$, $\frac{11}{18}$, $\frac{17}{24}$.

229.

1. $\frac{3}{5}$, $\frac{7}{15}$, $\frac{13}{24}$.
2. $\frac{11}{13}$, $\frac{5}{7}$, $\frac{11}{13}$.
3. $\frac{33}{101}$, $\frac{31}{76}$, $\frac{6}{91}$.
4. $\frac{13}{15}$, $\frac{5}{6}$, $\frac{11}{12}$.
5. $\frac{13}{91}$, $\frac{41}{181}$, $\frac{13}{17}$.
6. $\frac{5}{6}$, $\frac{13}{17}$, $\frac{19}{111}$.

230.

1. $\frac{11}{13}$, $\frac{5}{9}$, $\frac{13}{15}$.
2. $\frac{15}{19}$, $\frac{12}{15}$, $\frac{16}{18}$.
3. $\frac{3}{43}$, $\frac{7}{31}$, $\frac{23}{31}$.
4. $\frac{1}{16}$, $\frac{13}{91}$, $\frac{1}{15}$.
5. $\frac{181}{601}$, $\frac{2}{15}$, $\frac{11}{13}$.
6. $\frac{131}{401}$, $\frac{31}{181}$, $\frac{178}{401}$.

231.

1. $3\frac{3}{4}$.
2. $6\frac{6}{11}$.
3. $5\frac{11}{17}$.
4. $7\frac{7}{10}$.
5. $9\frac{13}{15}$.
6. $11\frac{17}{41}$.
7. $20\frac{13}{33}$.
8. $1\frac{1}{3}$.
9. $2\frac{13}{15}$.

232.

1. $11\frac{3}{5}$.
2. $24\frac{9}{11}$.
3. $22\frac{1}{13}$.
4. $64\frac{7}{10}$.
5. $61\frac{1}{3}$.
6. $481\frac{4}{15}$.
7. $15\frac{7}{10}$.
8. $61\frac{11}{13}$.
9. $157\frac{13}{14}$.

233.

1. $\frac{1}{20}$.
2. $\frac{13}{105}$.
3. $\frac{4}{175}$.
4. $\frac{2}{245}$.
5. $\frac{1}{231}$.
6. $\frac{3}{25}$.
7. $\frac{10}{231}$.
8. $\frac{3}{176}$.
9. $\frac{1}{312}$.
10. $\frac{7}{1152}$.

234.

1. $\frac{4}{9}$.
2. $\frac{7}{51}$.
3. $\frac{3}{112}$.
4. $2\frac{1}{26}$.
5. $\frac{1}{3}$.
6. $1\frac{1}{10}$.
7. $1\frac{1}{4}$.
8. $\frac{11}{63}$.
9. $\frac{3}{175}$.
10 $\frac{13}{187}$.

235.

	£	s.	d.
1.	5	13	$6\frac{4}{9}$
2.	13	3	$8\frac{1}{11}$
3.	37	10	$5\frac{1}{30}$
4.	6	14	$0\frac{2}{15}$
5.	13	7	$4\frac{7}{40}$
6.	21	3	$7\frac{9}{10}$
7.	16	2	$11\frac{3}{11}$

8. 7 yds. 1 ft. $11\frac{3}{16}$ in.
9. 2 ft. $7\frac{3}{8}$ in.
10. 4 yds. 1 ft. $2\frac{5}{16}$ in.

236.

	£	s.	d.
1.	2	3	$2\frac{3}{7}$
2.	7	11	$3\frac{3}{8}$
3.	12	10	$7\frac{1}{3}$
4.	9	7	$3\frac{3}{7}$
5.	13	0	$2\frac{1}{16}$
6.	5	19	$10\frac{3}{25}$
7.	18	3	$0\frac{3}{8}$
8.		17	$3\frac{3}{7}$
9.	2	16	$5\frac{1}{11}$
10.	10	8	$6\frac{11}{120}$

237.

	£	s.	d.
1.		14	$3\frac{1}{2}$
2.	13	6	$6\frac{3}{4}$
3.	9	5	4
4.	21	0	$7\frac{1}{2}$
5.	4 t. 4 cwt.		
6.	4 t. 13 cwt.		
7.	5 t. 17 cwt. 27 lbs.		
8.	10 hrs. 30 m. $38\frac{10}{13}$ s.		
9.	3 hrs. 12 min.		
10.	31 yds. 2 ft. $7\frac{1}{21}$ in.		

238.

1. £110 14*s.* $2\frac{1}{4}$*d.*
2. £85 12*s.* $0\frac{1}{2}$*d.*
3. £116 19*s.*
4. 27 m. 3 f. 9 p.
5. 333 yds. 9 in.
6. 340 a. 35 p.
7. 1220 a. 2 r. 5 p.
8. 88 t. 13 cwt. 3 qrs.
9. 3 lbs. 9 oz. 8 dwt. 12 grs.
10. 451 lbs. 11 oz. 6 dwt.

239.

1. $\frac{12}{35}$.
2. $\frac{33}{80}$.
3. $\frac{91}{180}$.
4. $\frac{15}{286}$.
5. $\frac{77}{360}$.
6. $\frac{100}{1008}$.
7. $\frac{73}{1056}$.
8. $\frac{11}{4004}$.
9. $\frac{1}{624}$.
10. $\frac{123}{6006}$.

240.

1. $8\frac{1}{3}$.
2. $1\frac{12}{45}$.
3. $3\frac{178}{207}$.
4. $34\frac{1}{15}$.
5. $75\frac{9}{28}$.
6. $30\frac{5}{24}$.
7. $\frac{138}{205}$.
8. $\frac{69}{182}$.
9. $8\frac{67}{100}$.
10. $35\frac{14}{57}$.

241.

1. $\frac{10}{189}$.
2. $\frac{13}{385}$.
3. $\frac{86}{715}$.
4. $\frac{40}{459}$.
5. $2\frac{18}{40}$.
6. $4\frac{1}{12}\frac{1}{14}$.
7. $5\frac{114}{385}$.
8. $8\frac{557}{1001}$.
9. $25\frac{82}{715}$.
10. $55\frac{1055}{1001}$.

242.

1. $\frac{14}{33}$.
2. $\frac{1}{6}$.
3. $\frac{5}{6}$.
4. $\frac{5}{7}$.
5. $\frac{6}{37}$.
6. $\frac{14}{33}$.
7. $\frac{3}{5}$.
8. $\frac{14}{15}$.
9. $\frac{9}{44}$.
10. $\frac{6}{11}$.

243.

1. $\frac{3}{10}$.
2. $\frac{3}{11}$.
3. $\frac{9}{25}$.
4. $\frac{12}{35}$.
5. $\frac{1}{7}$.
6. $\frac{1}{40}$.
7. $\frac{1}{105}$.
8. $\frac{5}{13}$.
9. $\frac{1}{24}$.
10. $\frac{2}{7}$.

244.

1. $\frac{10}{17}$.
2. $15\frac{4}{11}$.
3. $33\frac{1}{7}$.
4. $12\frac{5}{8}$.
5. $7\frac{3}{7}$.
6. 15.
7. $15\frac{3}{20}$.
8. $5\frac{5}{8}$.
9. $13\frac{3}{4}$.
10. $194\frac{1}{3}$.

245.

1. 27.
2. 12.
3. $12\frac{1}{2}$.
4. 720.
5. $362\frac{1}{4}$.
6. $73\frac{4}{15}$.
7. $8\frac{1}{3}$.
8. $1\frac{1}{2}$.
9. 140.
10. 8.

246.

	£	s.	d.
1.	28	12	$4\frac{3}{4}$
2.	56	9	$3\frac{3}{4}$
3.	184	8	$1\frac{15}{16}$
4.	969	7	6
5.	585	5	$3\frac{1}{7}$
6.	1804	11	$3\frac{3}{4}$
7.	177	0	$6\frac{3}{5}$
8.	1358	4	$9\frac{3}{4}$
9.	240	6	$8\frac{1}{2}$
10.	167	6	$10\frac{1}{2}$

247.

1. 2 oz. 5 dwts. $2\frac{8}{15}$ grs.
2. 3 oz. 7 dwts. $13\frac{11}{17}$ grs.
3. 1 oz. 12 dwts. $16\frac{13}{20}$ grs.
4. 3 lbs. 14 dwts. $12\frac{13}{15}$ grs.
5. 1 cwt. 21 lbs. 12 oz. $9\frac{13}{16}$ drs.
6. 11 lbs. 7 oz. $11\frac{1}{2}$ drs.
7. 4 cwt. 3 qrs. 15 lbs. 13 oz. $9\frac{99}{101}$ drs.
8. 2 yds. $10\frac{55}{113}$ in.
9. $10\frac{249}{421}$ in.
10. 1 ft. $8\frac{111}{113}$ in.

248.

1. $1\frac{1}{2}$.
2. $1\frac{3}{15}$.
3. $5\frac{19}{21}$.
4. $22\frac{1}{2}$.
5. $8\frac{3}{4}$.
6. $4\frac{3}{13}$.
7. $\frac{33}{55}$.
8. $\frac{3}{10}$.
9. $2\frac{33}{35}$.
10. $9\frac{3}{4}$.
11. $5\frac{11}{15}$.
12. $1\frac{1}{10}$.
13. $23\frac{1}{4}$.
14. $\frac{1}{40}$.
15. $\frac{35}{121}$.
16. $\frac{121}{100}$.
17. $16\frac{6}{17}$.
18. $159\frac{17}{35}$.
19. $5\frac{1}{11}$.
20. $12\frac{33}{35}$.

249.

1. $\frac{50}{140}$, $\frac{63}{140}$, $\frac{77}{140}$, $\frac{105}{140}$.
2. $\frac{24}{48}$, $\frac{2}{48}$, $\frac{42}{48}$, $\frac{28}{48}$.
3. $\frac{72}{180}$, $\frac{96}{180}$, $\frac{80}{180}$, $\frac{117}{180}$.
4. $\frac{7560}{17772}$, $\frac{12852}{17772}$, $\frac{12936}{17772}$, $\frac{8841}{17772}$.
5. $\frac{1008}{2772}$, $\frac{2352}{2772}$, $\frac{1848}{2772}$, $\frac{315}{2772}$.
6. $\frac{70}{105}$, $\frac{28}{105}$, $\frac{25}{105}$, $\frac{90}{105}$.

250.

1. $1\frac{8}{15}$.
2. $2\frac{1}{10}$.
3. $\frac{47}{55}$.
4. $2\frac{13}{19}$.
5. $\frac{41}{70}$.
6. $\frac{14}{15}$.
7. $1\frac{43}{48}$.
8. $1\frac{3}{10}$.
9. $\frac{188}{209}$.
10. $\frac{313}{357}$.

251.

1. $2\frac{7}{24}$.
2. $2\frac{1}{2}$.
3. $1\frac{1}{2}$.
4. $1\frac{3}{13}$.
5. $2\frac{1}{24}$.
6. $1\frac{1}{2}$.
7. $2\frac{3}{5}$.
8. $1\frac{3}{11}$.
9. $2\frac{13}{140}$.
10. $2\frac{55}{126}$.

252.

1. $1\frac{1}{12}$.
2. $2\frac{73}{140}$.
3. $2\frac{11}{35}$.
4. $2\frac{13}{20}$.
5. $\frac{121}{144}$.
6. $1\frac{127}{135}$.
7. $1\frac{203}{400}$.
8. $1\frac{121}{400}$.
9. $2\frac{29}{204}$.
10. $2\frac{37}{55}$.

253.

1. $15\frac{71}{126}$.
2. $19\frac{33}{140}$.
3. $14\frac{1}{8}$.
4. $8\frac{47}{105}$.
5. $6\frac{87}{112}$.
6. $20\frac{39}{104}$.
7. $21\frac{77}{95}$.
8. $23\frac{71}{140}$.
9. $9\frac{71}{112}$.
10. $11\frac{11}{35}$.

254.

1. $18\frac{79}{112}$.
2. $15\frac{103}{126}$.
3. $12\frac{1}{234}$.
4. $21\frac{36}{160}$.
5. $10\frac{11}{108}$.
6. $8\frac{47}{170}$.
7. $13\frac{43}{200}$.
8. $9\frac{83}{275}$.
9. $9\frac{87}{160}$.
10. $15\frac{3103}{3780}$.

255.

1. $\frac{7}{12}$.
2. $\frac{13}{15}$.
3. $\frac{7}{12}$.
4. $\frac{1}{15}$.
5. $\frac{1}{120}$.
6. $\frac{1}{105}$.
7. $\frac{1}{112}$.
8. $\frac{1}{231}$.
9. $\frac{7}{60}$.
10. $\frac{3}{56}$.
11. $\frac{31}{60}$.
12. $\frac{41}{336}$.

256.

1. $3\frac{1}{2}$.
2. $5\frac{5}{72}$.
3. $9\frac{1}{2}$.
4. $\frac{13}{56}$.
5. $1\frac{33}{120}$.
6. $12\frac{7}{20}$.
7. $14\frac{7}{72}$.
8. $63\frac{1}{24}$.
9. $49\frac{1}{56}$.
10. $48\frac{33}{100}$.
11. $5\frac{1}{56}$.
12. $34\frac{3}{56}$.

257.

1. $11\frac{11}{12}$.
2. $15\frac{111}{112}$.
3. $50\frac{103}{112}$.
4. $\frac{13}{21}$.
5. $\frac{3}{10}$.
6. $56\frac{81}{100}$.
7. $117\frac{1}{2}$.
8. $\frac{61}{1000}$.
9. $12\frac{113}{231}$.
10. $21\frac{113}{231}$.
11. $47\frac{1111}{1512}$.
12. $87\frac{1}{336}$.

258.

1. $\frac{13}{20}$.
2. $\frac{13}{15}$.
3. $9\frac{3}{4}$.
4. $1\frac{13}{72}$.
5. $\frac{5}{72}$.
6. $2\frac{1}{20}$.
7. $1\frac{1}{17}$.
8. $17\frac{11}{17}$.
9. $\frac{5}{56}$.
10. $\frac{3}{11}$.
11. $\frac{111}{168}$.
12. $\frac{13}{17}$.
13. $\frac{11}{56}$.
14. $7\frac{1}{2}$.
15. $\frac{13}{2352}$.
16. $\frac{5}{72}$.
17. $\frac{1}{1632}$.
18. $\frac{13}{120}$.
19. $\frac{1}{10}$.
20. $51\frac{1}{4}$.

259.

1. $1\frac{33}{112}$.
2. $\frac{11}{1050}$.
3. $3\frac{79}{1008}$.
4. $12\frac{5}{21}$.
5. $\frac{1013}{17100}$.
6. $\frac{5}{12}$.
7. $97\frac{1}{2}$.
8. $48\frac{3}{8}$.
9. $\frac{113}{1792}$.
10. $1\frac{7}{32}$.
11. $254\frac{77}{150}$.
12. $\frac{1331}{31104}$.
13. $\frac{27}{11025}$.
14. $\frac{67}{108864}$.

260.

1. $1\frac{10}{21}$.
2. $\frac{1313}{1365}$.
3. $1\frac{113}{1715}$.
4. $4\frac{10}{11}$.
5. $\frac{3333}{41930}$.
6. $1\frac{1}{7}$.
7. $1\frac{37}{105}$.
8. $\frac{7}{10115}$.
9. 41.
10. $1\frac{11}{11}$.
11. $\frac{3333}{11935}$.
12. $\frac{121}{1001}$.
13. $38\frac{1}{2}$.
14. $\frac{333}{3003}$.
15. $1\frac{333}{4235}$.
16. 45.
17. $21\frac{13}{15}$.
18. $\frac{51}{1001}$.

261.

1. $\frac{1}{2}$.
2. $\frac{9}{11}$.
3. $\frac{3}{4}$.
4. $\frac{17}{19}$.
5. $\frac{13}{7}$.
6. $\frac{1}{2}$.
7. $\frac{5}{11}$.
8. $\frac{13}{18}$.
9. $\frac{5}{11}$.
10. $\frac{11}{61}$.
11. $\frac{7}{19}$.
12. $\frac{10}{11}$.
13. $\frac{27}{200}$.
14. $\frac{25}{11}$.
15. $\frac{10}{9}$.

262.

1. $\frac{1}{216}$.
2. $\frac{8}{125}$.
3. $\frac{1}{343}$.
4. $\frac{1}{64}$.
5. $\frac{21}{784}$.
6. $\frac{63}{1331}$.
7. $\frac{10}{27}$.
8. $\frac{1}{36}$.
9. $\frac{6}{117}$.
10. $\frac{343}{1331}$.

263.

1. $\frac{100}{81}$.
2. $\frac{12}{25}$.
3. $\frac{60}{11}$.
4. $\frac{24}{25}$.
5. $\frac{1000}{11}$.
6. $\frac{44}{25}$.
7. $\frac{225}{484}$.
8. $\frac{3}{7}$.
9. $\frac{113}{225}$.
10. $\frac{132}{5}$.

264.

1. $\frac{45}{196}$.
2. $\frac{9}{25}$.
3. $\frac{14}{17}$.
4. $\frac{21}{11}$.
5. $\frac{24}{25}$.
6. $\frac{14}{7}$.
7. $\frac{225}{3007}$.
8. $\frac{243}{784}$.
9. $\frac{285}{3003}$.
10. $\frac{432}{324}$.

265.

1. 7320·14.
2. 3056·1.
3. 7·28.
4. 326·1.
5. 635·902.
6. 3.
7. 700.
8. 3120.
9. 9·1.
10. 3501000.
11. 3·0124.
12. 5·6373.
13. ·497.
14. ·0056321.
15. ·05637.
16. 5·92.
17. ·073.
18. ·000052.
19. 6·5.
20. ·000023.

267.

1. $\frac{4}{5}$, $\frac{1}{2}$, $\frac{3}{5}$.
2. $\frac{1}{4}$, $\frac{2}{5}$, $\frac{3}{10}$.
3. $\frac{2}{25}$, $\frac{1}{500}$, $\frac{3}{100}$.
4. $\frac{11}{25}$, $\frac{1}{125}$, $\frac{1}{3}$.
5. $\frac{3}{5000}$, $\frac{1}{40}$, $\frac{8}{125}$.
6. $\frac{3}{40}$, $\frac{23}{50}$, $\frac{1}{125}$.
7. $\frac{117}{200}$, $\frac{13}{400}$, $\frac{16}{125}$.
8. $\frac{9}{125}$, $\frac{19}{125}$, $\frac{18}{25}$.
9. $\frac{213}{500}$, $\frac{13}{125}$, $\frac{19}{500}$.
10. $\frac{3}{250}$, $\frac{3}{625}$, $\frac{21}{250}$.

268.

1. $5\frac{5}{8}$, $13\frac{3}{125}$.
2. $51\frac{14}{125}$, $37\frac{19}{125}$.
3. $106\frac{11}{50}$, $8\frac{29}{125}$.
4. $3\frac{1}{10}$, $3\frac{27}{200}$.
5. $12\frac{273}{2000}$, $71\frac{87}{200}$.
6. $7\frac{7}{125}$, $10\frac{101}{4000}$.
7. $93\frac{91}{2000}$, $3\frac{1}{100}$.
8. $42\frac{5}{32}$, $19\frac{371}{2000}$.
9. $9\frac{37}{5000}$, $2\frac{123}{125000}$.
10. $7\frac{13}{2000}$, $6\frac{1023}{6250}$.

269.

1. ·8, ·07, ·009.
2. ·23, ·051, ·97.
3. ·007, ·361, ·291.
4. ·147, ·12, ·0003.
5. ·0063, ·149, ·81.
6. 3·017, 4·101, 12·09.
7. 5·7, 3·69, 63·01.
8. 432·1, 5·938, 62·51.

270.

1. 1088·452.
2. 2870·7372.
3. 76·62.
4. 499·163.
5. 2016·945.
6. 12457·17.

271.

1. 66·465.
2. 978·626.
3. 1229·486.
4. 55·96751.
5. 122·4515.
6. 46·69921.

272.

1. 547·1901.
2. 28·28433.
3. 269·587.
4. 151·609595.
5. 392·8294.
6. 58·65801.
7. 728·0816.
8. 855·03751.
9. 37·01707.
10. 3514·6791.

273.

1. 111·8852.
2. 9619·882.
3. 149·6051.
4. 251·5993.
5. 896·6577.
6. 676·5001.
7. 82·2242.
8. 5395·273.
9. 1503·794.
10. 822·64476.

274.

1. 39·091.
2. 318·7761.
3. 358·7053.
4. 5·88899.
5. ·174998.
6. ·12738.
7. 2·762222.
8. 33·5588.
9. 4·206809.
10. ·0066384.

275.

1. 21·65479.
2. 2·41774.
3. ·286419.
4. 24·1472.
5. 9·9973.
6. 12·2437.
7. ·25301.
8. 1·7366.
9. 14·768783.
10. 5·99999.

276.

1. 47·78.
2. 8·9833.
3. ·065762.
4. 3·88894.
5. 12·10129.
6. 81·853.
7. 999·9999.
8. 26·63296.
9. ·000128.
10. 3·083103.

277.

1. 32·7911.
2. 19·18201.
3. 22·70284.
4. ·633051.
5. 22·407659.
6. 287·909961.
7. 1·937532.
8. 221·967989.
9. 24 829958.
10. 42·15922.

278.

1. 1614·0068.
2. 3654·74.
3. 73·50588.
4. 13·615525.
5. 4389·6054.
6. 8·61442.
7. 173·4477.
8. 43·25103.
9. 3·649163.
10. 1·17824.

279.

1. 3795·7452.
2. 49621·07.
3. 397·01016.
4. 594·70607.
5. 19647·552.
6. 5274·0012.
7. 2605·4595.
8. 77·796.
9. 9·950099.
10. 179·18544.

280.

1. 47357·088.
2. 193·963106.
3. 4298·27161.
4. 6·26482725.
5. 39493·615.
6. 91·27916.
7. 37746·375.
8. 351·807248.
9. 14764·4112.
10. 1130·63851.

281.

1. ·03846333.
2. ·3028854.
3. ·0180492.
4. ·022253.
5. ·0136406566.
6. 3·020151.
7. 456547·2.
8. 868·624.
9. ·000141.
10. ·00002.

282.

1. 1592·58.
2. 2·55164.
3. 6·51341.
4. ·71085.
5. 33501·065.
6. 72·6345.
7. 172·359.
8. 178658·025.
9. 1841·868.
10. 5864·845.

283.

1. ·15.
2. 3·12.
3. 36.
4. 4·13.
5. ·491.
6. 30·7.
7. 52·13.
8. 3·901.
9. 7·132.
10. ·432.

284.

1. 56·25.
2. 437·2.
3. 7·23.
4. ·079.
5. 48·5.
6. ·0636.
7. ·01608.
8. ·288.
9. ·00326.
10. ·01428.

285.

1. ·628294.
2. 3309·230769.
3. ·161304.
4. ·000961.
5. 68·179965.
6. 322·834646.
7. ·683995.
8. ·000536.
9. 8·839107.
10. ·51269.

286.

1. ·75, ·875, ·8.
2. ·3125, ·12, 2·26.
3. ·032, ·4275, 3·95.
4. ·325, 4·408, ·1375.
5. ·276, ·3425, 2·234.
6. ·9032, ·59375, ·70625.
7. ·484375, 2·31875, ·00584.
8. ·450625, ·0052, 1·940625.
9. ·0078125, 3·0492, 1·5008.
10. ·18046875, ·11584, ·046144.

287.

1. ·210526, ·418604, ·765432.
2. 5·546858, ·001361, ·70297.
3. ·02139, ·175913, ·855285.
4. ·681785, ·208791, 1·122334.
5. 6·188489, ·970297, ·036269.
6. ·043972, 14·471655, ·051233.

288.

1. 112·6857*s.*
2. £·015625.
3. 740·34 f.
4. £·013375.
5. 60·21488 yds.
6. ·00046875 m.
7. 7678·496 lbs.
8. .003125 t.
9. 57·06 min.
10. ·025 d.
11. ·004 h.
12. 19678·176 grs.
13. ·1630625 gal.
14. 19456·2 sq. in.

289.

1. 9*d.*
2. 2*s.* 6*d.*
3. 3*s.* 3*d.*
4. $\frac{3}{4}$*d.*
5. 3 t. 3 cwt.
6. 5 m. 3 f.
7. 7 dwt. 21 grs.
8. 9 hrs. 21 min.
9. 3 r. 31 p.
10. 5 t. 19 cwt.

290.

1. £3 8*s.* 6*d.*
2. £2 18*s.* 4$\frac{1}{2}$*d.*
3. 8$\frac{1}{4}$*d.*
4. 17 a. 1 r. 9 p.
5. 4 cwt. 2 qrs. 7 lbs.
6. 6 hrs. 21 m. 54 sec.
7. 12 d. 12 hrs. 54 m.
8. 1*s.* 0$\frac{3}{4}$*d.*
9. £2 3*s.* 3$\frac{3}{4}$*d.*
10. 3 t. 4 cwt. 2 qrs. 21 lbs.

291.

1. £5 5*s.* 2$\frac{1}{2}$*d.*
2. £3 0*s.* 8$\frac{55}{133}$*d.*
3. 7 t. 6 cwt. 1 qr. 7$\frac{21}{133}$ oz.
4. 5 d. 5 h. 3 m. 7$\frac{1}{2}$ sec.
5. £3 12*s.* 7$\frac{1}{2}$*d.*
6. £1 2*s.* 6$\frac{51}{100}$*d.*
7. 41t. 3cwt. 3qrs. 21lbs. 11$\frac{21}{133}$ [oz.
8. 17 a. 2 r. 17$\frac{3}{5}$p.
9. 26 m. 57$\frac{21}{133}$ sec.
10. 21 a. 2 r. 28$\frac{84}{133}$ p.

292.

1. 3·7625.
2. 2·625.
3. 13·01875.
4. ·99167.
5. ·17292.
6. 5·51042.
7. 7·13646.
8. ·77604.
9. ·08542.
10. 31·21146.

293.

1. ·28928.
2. 16·3125.
3. ·7375.
4. 7·18333.
5. ·34411.
6. ·58667.
7. 1·09773.
8. 3·6875.
9. 5·52778.
10. ·08333.
11. ·05366.
12. ·1183.

294.

1. ·8.
2. ·91.
3. ·584.
4. ·721.
5. ·641.
6. ·608.
7. ·56875.
8. 1·724.
9. 6·6536.
10. ·8025.
11. ·13775....
12. ·72.

295.

1. $\cdot\dot{6}$, $1\cdot\dot{4}$, $\cdot\dot{8}\dot{3}$.
2. $\cdot5\dot{8}\dot{3}$, $\cdot7\dot{3}$, $\cdot7\dot{2}$.
3. $\cdot\dot{4}28571\dot{4}$, $\cdot\dot{3}\dot{6}$, $\cdot1\dot{3}\dot{8}$.
4. $\cdot30\dot{3}$, $3\cdot1\dot{7}$, $5\cdot00\dot{3}$.
5. $\cdot04\dot{6}$, $\cdot9\dot{3}\dot{6}$, $\cdot3\dot{1}\dot{9}$.
6. $\cdot6\dot{2}\dot{4}$, $\cdot00356\dot{}$, $\cdot5005\dot{}$.
7. $\cdot3102\dot{}$, $\cdot130\dot{}$, $\cdot729\dot{}$.
8. $\cdot3938\dot{}$, $\cdot5346\dot{}$, $\cdot30296\dot{}$.
9. $\cdot7231\dot{}$, $\cdot13276\dot{}$, $\cdot7237\dot{}$.
10. $\cdot32651\dot{}$, $\cdot52007\dot{}$, $\cdot34278\dot{}$.

296.

1. $\frac{7}{9}$, $\frac{2}{3}$.
2. $\frac{11}{90}$, $\frac{4}{11}$.
3. $\frac{13}{111}$, $\frac{23}{37}$.
4. $\frac{316}{999}$, $\frac{2}{37}$.
5. $\frac{644}{999}$, $\frac{7}{101}$.
6. $\frac{50}{101}$, $\frac{100}{303}$.
7. $\frac{2}{111}$, $\frac{2}{111}$.
8. $\frac{1}{7}$, $\frac{27777}{99991}$.

297.

1. $\frac{41}{90}$, $\frac{11}{30}$.
2. $\frac{37}{330}$, $\frac{333}{303}$.
3. $\frac{7}{370}$, $\frac{167}{1665}$.
4. $\frac{2}{555}$, $\frac{473}{1136}$.
5. $\frac{296}{333}$, $\frac{923}{2478}$.
6. $\frac{4083}{13330}$, $\frac{21127}{19000}$.
7. $\frac{23}{2220}$, $\frac{7}{4004}$.
8. $\frac{1}{888}$, $\frac{1}{99990}$.

298.

1. 379·11781.
2. 150·429.
3. 92·95366.
4. 558·33289.
5. 202·80073.
6. 70·07594.
7. 1571·54652.
8. 200·74529.

299.

1. 36·85006.
2. ·33598.
3. 217·88331.
4. 5·90859.
5. ·00729.
6. ·01992.

300.

1. 1260.
2. 37.
3. (1) $\frac{17}{45}$. (2) $3\frac{31}{45}$. (3) $\frac{13}{77}$.
4. 8·1625.
5. 3757·3264.
6. $11\frac{111}{242}$.
7. (1) ·732. (2) ·0732.
8. (1) 1·05. (2) $\cdot\dot{9}52380\dot{}$.
9. (1) £62 0*s.* $8\frac{13}{14}$*d.* (2) £5 15*s.* $9\frac{8}{19}$*d.*
10. $\frac{3}{110}$; $4\frac{17}{21}$; $30\frac{1}{2}$.
11. (1) $\frac{144}{1331}$. (2) $\frac{243}{1331}$.
12. $11\frac{11}{12}$.
13. (1) 6*s.* 2*d.* (2) £65 12*s.* 6*d.* (3) £437 4*s.*
14. 5·25.
15. $\frac{19}{77}$.
16. 28·934443.
17. £6219 6*s.* 3*d.*
18. £4 2*s.* $8\frac{7}{71}$*d.*
19. $16\frac{3}{13}$.
20. $\frac{4}{5}$.
21. $\cdot\dot{1}285714\dot{}$.
22. $1\cdot\dot{2}9638811\dot{}$.
23. $8\cdot\dot{2}\dot{7}$, $7\cdot58\dot{3}$.
24. £54 13*s.* 4*d.*
25. $\frac{1}{8}$, $\frac{14}{15}$, $\frac{8}{15}$.
26. 8640.
27. (1) $\frac{171}{5555}$. (2) $21\frac{8}{13}$.
28. 5·4.
29. £49 14*s.* $9\frac{3}{10}$*d.*
31. £49 2*s.* 6*d.*
32. (1) $\frac{3}{13}$. (2) $\frac{13}{5}$.
33. (1) 4. (2) $3\frac{214}{5}$.
34. $\frac{3}{100}$; $\frac{1111}{1000}$; $17\frac{333}{990}$.
35. £772.
36. 1·09363 yds.
37. 3·22.
38. (1) ·011296595. (2) 575.
39. 13 m. 4 f. 128 yds. 2 ft. 8 in.
40. $\frac{7}{110}$.
41. 227·2435.
42. 220·09625.
43. $\cdot\dot{0}0\dot{9}$; $\cdot01590\dot{}$; $\cdot\dot{0}12345679\dot{}$; $\cdot\dot{1}58\dot{3}$.

301.

1. 8 sq. ft. 108 sq. in.
2. 25 sq. yds. 5 sq. ft.
3. 1 sq. yd. 6 sq. ft. 51 sq. in.
4. 27 sq. yds. 7 sq. ft.
5. 17 sq. yds. 3 sq. ft. 104 sq. in.
6. 19 sq. yds. 4 sq. ft.
7. (1) 36 sq. yds. 1 sq. ft. 72 sq. in. (2) 21 sq. yds. 126 sq. in. (3) 28 sq. yds. 5 sq. ft. 36 sq. in.
8. 3 a. 2 r. 15 p.
9. 10 a. 2 r.
10. 2 sq. yds. 7 sq. ft. 54 sq. in.

302.

1. 1 yd. 2 ft.
2. 2 ft. 3 in.
3. 4 yds. 2 ft. 6 in.
4. 7 ft. 8 in.
5. 5 yds. 1 in.
6. 30 yds.
7. 24 poles.
8. 10 yds. 1 ft. 6 in.
9. 5 yds. 3 in.
10. 31 yds. 1 ft.
11. 110 yds.

303.

1. 15 c. ft. 1212 c. in.
2. 77 c. yds. 7 c. ft.
3. 8 c. yds. 972 c. in.
4. 35 c. yds. 15 c. ft. 1536 c. in.
5. 74 c. yds. 17 c. ft. 1080 c. in.
6. 3174 c. ft.
7. 25055 c. yds. 15 c. ft.
8. 24 c. ft. 404 c. in.
9. 3 c. yds. 20 c. ft. 1088 c. in.
10. 1 c. yd. 25 c. ft. 299 c. in.

304.

1. 1 ft. 6 in.
2. 3 ft. 4 in.
3. 162 ft.
4. 21 ft. 6 in.
5. 16 sq. ft.

305.

	£	s.	d.
1.	1	14	8
2.	2	4	7½
3.	37	7	0
4.	165	2	6
5.	94	10	0
6.	87	8	0
7.	1	16	0
8.	23	13	11½
9.	289	2	10
10.	81	0	8

306.

1. 1 t. 16 cwt. 2 qrs. 1 lb.
2. 470 m. 5 f.
3. 6 cwt. 1 qr. 20 lbs.
4. 9 yds.
5. 626 yds. 1 qr.
6. 162 gals. 2 qrts.
7. 51 a. 3 r.
8. 74 qrs. 2 bush.
9. 207 t. 14 cwt. 1 qr.
10. 2 lbs. 5 oz. 1 dwt. 6 grs.

307.

	£	s.	d.
1.	2	0	5
2.	1	4	6½
3.	8	6	6
4.	2	2	3½
5.		13	6½
6.	342	7	6
7.	90	19	0
8.		19	9
9.	5	1	6
10.	4	6	4½

308.

	£	s.	d.
1.		12	6
2.	323	7	6
3.	47	6	9
4.	5	14	9
5.		1	8
6.	25	0	0
7.	154	11	9
8.	10	6	4
9.	4	10	7½
10.	343	1	10¼

309.

1. 20.
2. 30.
3. 63 days.
4. 4 m. 3 f. an hour.
5. 40 lbs.
6. 13 yds. 2 qrs.
7. 4 h. 40 m.
8. 25 h. 50 m.
9. 253 a. 35 p.

310.

1. 1 cwt.
2. 9 yds. 2 qrs.
3. 3 lbs. 4 oz.
4. 8 ft. 7 in.
5. 3 st. 5 lbs.
6. 9 qrs.
7. 6300 c. ft.
8. 18 days 9 hrs.
9. 100 a. 3 r.
10. 78 t. 12 cwt.

311.

1. 98 miles.
2. £1 13*s.* 4*d.*
3. £22 1*s.*
4. £18 19*s.* 2*d.*
5. 13.
6. £23 18*s.* 10*d.*
7. 7 days.
8. 8 days.
9. £16 10*s.*
10. 17.
11. £276.
12. 5 lbs. 7 oz.
13. 21 days.
14. 6 months.
15. £10 8*s.* 4*d.*
16. 5⅛ hours.
17. £18 18*s.*
18. £1445 3*s.* 6*d.*
19. 420.
20. £153 11*s.* 3*d.*
21. 7 men.
22. 20 men.
23. £5000.

312.

1. 74, 185, 333.
2. £144, £528, £624, £1008.
3. 124 boys 155 girls.
4. 2597 oak, 1855 ash, 1484 beech.
5. £11, £22, £33, £44, £55.
6. 5 lbs. 12 oz. green, 23 lbs. black.
7. 3 gals. 3 qrts., 1 gal. 1 qrt.
8. 11 oz. 2 dwts.
9. 3 t. 4 cwt. copper, 1 t. 16 cwt. zinc.
10. 1 t. 6 cwt. 1 qr. nitre, 3 cwt. 2 qrs. sulphur, 5 cwt 1 qr. charcoal.
11. A, £76 5*s.*; B, £101 13*s.* 4*d.*; C, £127 1*s.* 8*d.*
12. 1 lb. 10 oz. 11 dwts. 22 grs.
13. A, £2 14*s.* 2*d.*; B, £2 8*s.* 9*d.*; C, £2 3*s.* 4*d.*; D, £1 17*s.* 11*d.*
14. 2 oz. 16 dwts. 21 grs. gold, 1 oz. 8 dwts. 3 grs. copper.
15. A, £76 6*s.* 9*d.*; B, £50 17*s.* 10*d.*; C, £25 8*s.* 11*d.*
16. Son's share, £2418; daughter's share, £1209.
17. £78 18*s.* 6*d.*, £52 12*s.* 4*d.*, £39 9*s.* 3*d.*
18. 10*s.* 2½*d.*, 15*s.* 3¾*d.*, 16*s.* 4*d.*, 2*s.* 11*d.*
19. A, £1 6*s.* 7*d.*; B, £1 5*s.* 8*d.*; C, £1 10*s.* 8*d.*

313.

	£	*s.*	*d.*
1.	64	0	0
2.	159	0	0
3.	135	18	0
4.	1065	8	0
5.	90	3	3
6.	614	14	4
7.	110	3	10½
8.	6032	3	6
9.	655	12	5½
10.	66	0	0

314.

	£	*s.*	*d.*
1.	1141	10	11½
2.	821	17	5
3.	8374	19	9
4.	726	15	0
5.	451	17	3¾
6.	4451	17	7
7.	7966	9	11
8.	556	19	4
9.	8035	6	8¾
10.	1118	9	6

315.

1. 4 years.
2. 3½ years.
3. 4 p. c.
4. 2½ p. c.
5. £172 10*s.*
6. £530.
7. 30 years.
8. 3½ p. c.
9. 2 p. c.
10. 5 years.
11. £800.
12. £625 2*s.* 1*d.*
13. £365.
14. 4¾ p. c.
15. 5½ years.

316.

	£	*s.*	*d.*
1.	686	10	9·6
2.	8998	18	2·88
3.	1076	17	9¾
4.	353	18	0·6
5.	792	5	5·28

317.

	£	*s.*	*d.*
1.	94	0	7·39
2.	28	13	6·04
3.	132	6	1·56
4.	164	2	8·2
5.	758	4	4·61

318.

1. 60, 65.
2. 15*s.* 5*d.*
3. 9 dwts. 18 grs.
4. £2 0*s.* 2*d.*
5. £50 10*s.*
6. 40½ lbs.
7. 13⅓ p. c.
8. 20 p. c.
9. 3 p. c.
10. 14$\frac{1}{17}$ p. c.
11. 3½*d.* per lb.
12. 2*s.* 1*d.*
13. £52 13*s.* 4*d.*
14. 2$\frac{14}{17}$ p. c.
15. 40 p. c.
16. £1 10*s.*, 50 p. c.
17. 54 gals.
18. 18522.
19. 30 p. c.
20. 14$\frac{2}{7}$ p. c.

319.

1. $\frac{3}{17}$.
2. $\frac{1}{51}$.
3. 6 hrs. 12 min.
4. 26 min. 40 sec.
5. 15 min. 19$\frac{7}{17}$ sec.
6. 3½.
7. 2 hrs. 48 min.
8. 8 hrs. 30 m.
9. 4½ days.
10. 22 hrs.
11. 12 hrs.
12. 2 days.
13. 2 hrs. 55 min.
14. 3 hrs. 44 min.
15. 26¼ days.
16. 13 min. 20 sec.
17. 12 min. past 2 o'clock.
18. 1 hr. 27 min. 16$\frac{4}{11}$ sec.
19. 25 hrs. 42 min. 51$\frac{3}{7}$ sec.

MISCELLANEOUS EXAMPLES.

1. 1056$\frac{4}{9}$.
2. (1) $\frac{4}{51}$. (2) $\frac{4}{51}$.
3. £1 2*s.* 5$\frac{3}{4}$*d.*
4. 1$\frac{1}{10}$$\frac{1}{4}$.
5. £1838 3*s.* 4*d.*
6. 116$\frac{1}{117}$.
7. £4 4*s.*
8. £37 17*s.* 1*d.*
9. £5 15*s.* 9$\frac{9}{19}$*d.*
10. £50 6*s.* 10½*d.*
11. ·16875.
12. £6580 10*s.*
13. £1 5*s.*
14. 2345.
15. $\frac{2}{3}$$\frac{4}{11}$$\frac{4}{33}$.
16. £8 11*s.* 5$\frac{3}{4}$*d.*
17. 908·8577.
18. £9 10*s.* 6$\frac{1}{4}$*d.*
19. 791·83104.
20. £869 1*s.* 3*d.*
21. 19*s.* 1$\frac{1}{11}$*d.*
22. (1) ·38362.
(2) 5000.
23. £12 18*s.* 6*d.*
24. 2700 tons.
25. $\frac{13}{63}$$\frac{9}{11}$.
26. 4557000.
27. £860 9*s.* 2$\frac{2}{3}$*d.*
28. £8 16*s.* 0$\frac{1}{4}$*d.*
29. 107.
30. £3 4*s.* 0$\frac{3}{4}$*d.*
31. (1) £1 10*s.* 6*d.*
(2) £1 10*s.* 5*d.*
32. $\frac{19}{37}$.
33. $\frac{11}{12}$.
34. £2 2*s.* 5*d.*
35. 8*s.* 9$\frac{3}{4}$*d.*
36. 16$\frac{7}{10}$.
37. £117 8*s.* 7$\frac{1}{4}$*d.*
38. £1 16*s.* 2$\frac{3}{4}$*d.*
39. 10890.
40. 5555*d.* 13h. 20m.
41. ·07.
42. £74 18*s.* 0$\frac{1}{4}$*d.*
43. 1080.
44. (1) $\frac{1}{13}$. (2) $\frac{4}{17}$.
45. 39.
46. 30 lbs. 2 oz. 19 dwts.
47. (1) 8*s.* 2*d.*
(2) 4*s.* 4*d.*
48. (1) £100 10*s.* 5½*d.*
(2) £20 0*s.* 5½*d.*
49. £107 13*s.* 2$\frac{4}{15}$*d.*
50. 7*s.* 3*d.*

320.

1. $\frac{1}{15}$.
2. 24 sq.yds. 6 sq.ft. 24 sq.in.
3. $\frac{7}{17}$.
4. 135.
5. 796110.
6. 100 tons.
7. £634 17*s.* 4*d.*
8. 442.
9. (1) $1\frac{13}{15}$. (2) $13\frac{33}{165}$.
10. 4321 ft.
11. 11.
12. 9 cwt. 3 qrs. 14 lbs. $12\frac{1}{2}$ oz.
13. ·42.
14. £35 7*s.*
15. 65 yds.
16. £160 3*s.* 7*d.*
17. 9318.
18. 8 in.
19. 96 m. 2 f. 11 yds. 1 ft.
20. (1) $\frac{44}{45}$. (2) $\frac{43}{143}$.
21. 85 sq.yds. 6 sq.ft. 126 sq.in.
22. £90.
23. £53 12*s.*
24. $7\frac{1}{2}d.$
25. £7 7*s.* $10\frac{1}{2}d.$
26. ·308237.
27. £21 11*s.* $5\frac{11}{12}d.$
28. £625 19*s.* $0\frac{3}{4}d.$
29. 10.
30. 48.
31. £1 12*s.* 11*d.*
32. $\frac{3}{77}$, $\frac{7}{154}$.
33. (1) 6 a. 3 r. 9. p. (2) 6 m. 45 sec.
34. £39 0*s.* $5\frac{1}{2}d.$
35. £309 9*s.*
36. $\frac{4}{5}$.
37. 2 hrs. 12 m.
38. 195 yds.
39. (1) 185 lbs. 11 oz. 5 dwts. (2) 23 lbs. 8 oz.
40. £4488.
41. (1) £6 13*s.* 4*d.* (2) £13 6*s.* 8*d.* (3) £20. (4) £26 13*s.* 4*d.* (5) £33 6*s.* 8*d.*
42. 3 yds.
43. $10\frac{4}{15}$.
44. £560 14*s.*
45. 9*s.* 9*d.*
46. ·820225.
47. £60 15*s.*
48. £896.
49. £1 13*s.* $5\frac{1}{2}d.$
50. 56 dozens.
51. $6213\frac{193}{253}$ miles.
52. 12.
53. £184 15*s.* 6*d.*
54. (1) £40 1*s.* 8*d.* (2) £43 3*s.* 4*d.* (3) £46 5*s.*
55. The former by 10 cwt. 2 qrs. $15\frac{3}{4}$ lbs.
56. £40.
57. £183.
58. £473 2*s.* 6*d.*
59. $5483\frac{33}{195}$.
60. 4 c. ft. 440 c. in.
61. $\frac{881}{1100}$.
62. (1) 3 m. 160 yds. (2) 17 min.
63. £502 1*s.* $8\frac{20}{167}d.$
64. 13 lbs. 2 oz.
65. 9 cwt. 2 qrs. 16 lbs.
66. 8687.
67. 19360.
68. 35200 c. yds.
69. ·11.
70. £128 8*s.* 9*d.*
71. 135 yds. 2 ft. $1\frac{5}{18}$ in.

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